

# SCOPE NEWSLETTER

IN EUROPE

Number Ten - May 1994

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## OPINION SECTION

Following the publication in the previous SCOPE NEWSLETTER of the article "The Effects of Polycarboxylate on the Uptake of Iron by 3 Marine Phytoplankton Species", we received a letter from BASF, a leading manufacturer of polycarboxylates for detergents, which questions the validity of some of the conclusions of the study mentioned. We publish in this issue the letter from BASF and the reply by the author of the study, Dr. U. Hortsman .....p. 9

### **UNITED KINGDOM Detergent phosphates and the environment : an environmental study yields new results**

**The first comprehensive Life Cycle Assessment (LCA) study comparing two detergent builder systems - sodium tripolyphosphate and zeolite/PCA - was published by Landbank Environmental Research & Consulting, based in the United Kingdom**

Results of this 18-month research project are published in "The Phosphate Report", written jointly by Bryn Jones, former director of Greenpeace and Bob Wilson, senior lecturer in statistics. In their study, the authors reach a conclusion which challenges conventional beliefs : "There is no real difference in terms of environmental impact between the two competing builder systems".

SCOPE is a non-commercial, non-profit making European association based in Brussels.

Its aim is to provide a platform for objective and scientific information on the effects of phosphate-containing and phosphate-free detergents on the environment.

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produced by European Communications Unit - 81, rue François Mermet - 69160 TASSIN - FRANCE - Tél. (33) 78 34 23 39

An L.C.A. evaluates the environmental performance of products and processes on a "cradle to grave" basis. The study is subdivided into three stages : Inventory, Impact Analysis and Improvement Analysis.

In the first part of the Landbank study, data were gathered to form an inventory of the two builder systems' life cycles, taking into account the extraction of the raw materials, energy production and consumption, transportation, processing, use and disposal. In all, some 39 pollutants or groups of pollutants were identified.

The comparison of the two builder systems is made on an equivalent performance basis. Extensive washing tests were carried out to determine the relative performance of the two systems. The study concludes that in average UK water hardness conditions, it takes 1 kg of zeolite/PCA to obtain similar performance to 0.7 kg of sodium tripolyphosphate.

In the Impact Analysis, the inventory of pollutants was submitted to a Delphi panel of 11 senior scientists from British universities - all of senior lecturer status or above - and five water quality and eutrophication experts who were invited to assess and attribute a score to each of the pollutants. To ensure the validity of the results, the scientists were guaranteed complete anonymity throughout the exercise.

These results were applied to the inventory to obtain an overall score of environmental impact points for each builder system throughout its life cycle.

The panel awarded 107 points to sodium tripolyphosphate against the slightly worse score of 110 points to zeolite/PCA and led the authors to conclude : "The two builder systems have an almost identical performance in terms of environmental impact. Based on these results, there is no real difference between the environmental impact of the two builder systems which could be used to support the claim that one is less damaging for the environment than the other".

Concerning the issue of eutrophication which has been the main justification for the bans of phosphates from detergents, the report points out that phosphorus is only one of the factors which can lead to excessive algal growth. Furthermore, the detergent's contribution to the total phosphorus load in fresh waters is only around 10 to 25 per cent. In these conditions, the bans of phosphates from detergents formulations "would not achieve the desired results and would therefore serve no purpose".

Based on the Impact Analysis, the study goes on to identify ways in which certain aspects of the production of sodium tripolyphosphate can be improved to reduce the overall impact of its life cycle. In particular, the report identifies technologies which can be used to remove phosphates in municipal sewage treatment works as calcium phosphate. This is an excellent industrial raw material for the production of phosphoric acid and phosphates. No other detergent ingredient can be recovered and recycled in this way.

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Present in all living beings, phosphates are a valuable material used in the manufacture of animal feedstuff, detergents, fertilisers and a wide variety of other products. Phosphate recovery offers a renewable source of phosphate and satisfies the criteria for sustainability.

After years of controversy over whether or not detergents should contain phosphates, the conclusions of "The Phosphate Report" suggest that any measure taken with the intention of reducing the impact of human activities on the environment must be assessed very carefully before being implemented.

*The Phosphate Report, Landbank Environmental Research and Consulting, January 1994.*

## SWEDEN Spreading of sludge on arable land

A report from Sweden examines the results of long term experiments of sludge spreading on arable land.

Field experiments have been conducted in the south west Skane to investigate the nutrient value of sludge and the long term effects of its being spreading on soil and crops. An extensive programme of analysis has also been carried out in order to survey the content of heavy metals, nutrients and organics hazardous for the environment in the sludge, soil and crops.

The results of these field trials conducted in Sweden since 1981 reveal that the use of sludge as a fertilizer on agricultural land leads to an increase in crop production without significantly changing the amount of metals and organic compounds in either the soils or crops.

The study has been conducted at two separate locations in the south of Sweden. The sludge was supplied by the sewage works of Lund and Malmö. Spreading on the land occurred in the autumn of 1981, 1985 and 1989, land investigation has been carried out since 1989.

The fields were separated in three segments : one receiving no sludge, the second one 1 ton/ha/year (corresponding to normal fertilizer usage) and the third one a triple amount. The sludge was applied every fourth year.

Survey results show that, while the amount of phosphorus increases in soil spread with sludge, the cadmium value remains unchanged throughout the experiment. On the other hand, copper values have increased considerably and mercury values have changed where a triple dose of sludge was applied. The other metal contents have not been affected measurably by sludge supply, apart from zinc which has increased in one of the fields.

Concerning the presence of organic compounds, it has not been possible to quantify any of the 70 substances contained in the Priority Pollutant List in any of the segments.

On the other hand, only 3 and 5 substances have been identified in respectively two parcels of land without sludge and 1 and 8 substances in 2 parcels of land fertilized with sludge. EOCL and PCB have not been identified in spite of extensive analysis.

It has been determined that a normal dose of sludge (1 ton/ha/year) gives an average increase of 13 % in crop yield. When the sludge dose is combined with a dose of normal fertilizer, the treatment has resulted in a crop yield increase of 8 % in addition to the increase due to the fertilizer itself.

The biggest increase has been obtained after the first and second years of sludge supply.

Regarding the presence of metals in plants, there is no difference in cadmium and copper content between crops which have been treated with sludge and crops which have received conventional fertilizer or no treatment. Nickel and zinc level increases slightly when sludge is applied while mercury occurs in such small amounts in plants that no value can be measured.

Out of the 70 organic compounds listed as Priority Pollutant substances, none has been identified in wheat and one (DEHP) was identified in rape in a value too low to be quantified. Dioxine content was higher in crop cultivated in the untreated segment than in the segment with conventional fertilizer or sludge.

Spreading of sludge is a way to recover valuable resources from waste water to be recycled as plant fertilizer. It also represents a way for municipalities to avoid the costly disposal of sludge by incineration or in landfills.

*SLAMSPRIDNING PA AKERMARK, resultat av 10 ars fältförsök i sydvästra Skane, Lägesrapport III. The agricultural Society of Malmöhus County, Bjärred, Water Technology, Lund University of Technology and SYSAVUTVECKLING AB, Malmö.*

## **SWEDEN Problems and risks in agricultural sludge use**

**An article by a scientific expert of the VAV, water and sewage works association in Stockholm examines how fears about using sewage sludge in agriculture are based on a lack of information instead of real health or environment risks.**

Swedish farmers are generally reluctant to use sewage sludge as a fertilizer. The reason is a concern for potential environmental effects due to the presence in sludge of environmentally hazardous substances. Despite the fact that sludge quality has never been as good as now, this situation leads to increasing disposal difficulties for municipalities.

These fears are based mainly on ignorance concerning the reality of risks that could be associated with this practice.

The four potential reasons for concern about sludge use in agriculture are :

- Beliefs that sludge contains substances hazardous for the environment.
- Common concern in society about chemicals in general.
- Instinctive repulsion due to the fact that sludge contains human faeces.
- Ethical reasons from people opposed to the use of chemicals and for whom nature and the countryside should be kept untouched.

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More time and energy need to be spent on research so information can be provided to allay irrational fears.

In its second part, the article discusses the validity of the belief that sludge is harmful for humans and the environment. It identifies 10 pathways by which the use of sludge might affect man, animals, plants and soil.

Metals and organic substances do not interact in the same way with their environment. In the risk assessment, it has been assumed that heavy metals will accumulate while organic compounds reach sooner or later an equilibrium.

Of all metals, the study shows that copper and zinc are present in the highest proportion in sludge. It is a fact that copper and zinc are needed for the growth of plants and animals. On the contrary, the contribution of sludge spreading to mercury and cadmium values represents the lowest concentration of all the metals studied, with respectively 0.2 and 0.25 mg/m<sup>2</sup>/year. As explained in the next paragraph, these contributions will not represent any risk for health of humans or the environment.

When considering the highest metal intake according to the World Health Organization and the metal content in sludge, the limiting pathways for each metal can be assessed. When taking into account the atmospheric fall out, the sludge can be used in most cases several thousand years before reaching the accumulation limit.

Despite the presence in sludge of a number of organic substances suspected of being carcinogenic, there is no reason to believe that sludge use on agricultural land is harmful for human health.

Many of these substances have their origin in urban activities, but some are also produced naturally by plants.

In most cases, the concentration of these compounds is below detection limits. Assessing the amount of some of the organic substances (benzopyren, hexachlorobenzene, DDT and PCB) present in sludge, soil, animals, plants and humans, the study concludes that risks are non-existent.

Concerning the presence of tensides in sludge, the validity of the use of certain products is questioned. Tensides, like nonylphenol and LAS used in conventional detergents, will slowly decompose and end up in sludge while alcohol-based tensides - often considered environmentally friendly - will rapidly dissolve in water and affect the more sensitive aquatic environment.

Dr. Hellström states that "there will always be a problem that full guaranties can not be given. Therefore a certain level of concern will always remain, which is not necessarily negative".

*Thomas HELLSTRÖM, VAV, VATTEN, 49 : 257 - 263, LUND 1993.*

## FRANCE

### Comparison of Phosphate based and Phosphate free detergents regarding the capacity to remove bacteria and germs from fabrics

Comparative tests were performed by Pasteur Institute in Lyon to compare the elimination of germs and bacteria from fabrics washed with 2 detergents, one built with phosphates and the other with a substitute. Both types of detergent had similar results except for the removal of bacteria *Pseudomonas Aeruginosa* and total aerobic micro-organisms. In this case, the phosphate based detergent showed a better performance.

This study was conducted in cooperation with three volunteer families, each of them composed of two parents and two children who carried out the tests with their personal soiled clothes in their own washing machines.

The two powders tested were :

- one containing a phosphate free builder system with a binary anionic/non ionic surfactant (ANIT),
- the second with the same surfactant but with a phosphate based builder (ANIP).

They contained no bleaching system and were used at the same concentration.

For each experiment, before addition of detergents, a prewash with water only was carried out. The microbiological species were counted in the prewash water and in the last rinsing water.

These species were :

- aerobic (20°C and 37°C) and anaerobic (20°C) micro-organisms,
- coliforms (37°C, and thermotolerant coliforms (44°C),
- group D streptococci (37°C),
- sulfite-reducing anaerobic micro-organisms (vegetative and sporuled forms),
- presumably pathogenic *Staphylococcus aureus*,
- *Pseudomonas aeruginosa*,
- yeasts and molds.

Quantities of each species on soiled clothes before washing were homogeneous. For most species, the quantities present in the last rinsing water were significant and higher than if the full cycle had been carried out with water only.

The decrease in numbers of micro-organisms between the prewash with water alone and the last rinsing water were as follows :

- for total aerobic and anaerobic flora, the decrease rate was approximately 5 log. for ANIT and 6 log. for ANIP (in one case it increased to 4 log. with ANIP),
  - for both formulations, the decrease rate of coliforms and streptococci varied between 2 and 6 log.,
  - with both powders, the number of sulfite-reducing anaerobic micro-organisms was too low to be meaningful,
  - for pathogenics, no *Staphylococcus aureus* were found in the rinsing waters with ANIT and were present only in two cases with ANIP,
  - for *Pseudomonas*, the results were variable and reached 4 log., with both ANIP and ANIT.
- In one case, with ANIP the number of *Pseudomonas* in the last rinsing water was more important with an increase rate of 5 log.

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The decrease rates of yeasts and molds were approximately 4 log. for both powders.

This study showed, firstly, that micro-organisms are removed from material as soon as it is soaked in water, before the addition of detergent powder. Secondly, the type of builder system used does not affect the removal of germs, except for the removal of *Pseudomonas aeruginosa*. With the TPP based builder and for a series of tests, an increase of this specie was observed in the last rinsing water. This indicates that the removal of these micro-organisms from material is better performed by the formulation with ANIP. The same type of result was found for total aerobic flora.

*Etude comparative de deux systèmes "builder", réalisée sur du linge sale de trois familles volontaires, H. PEROLLET, Département d'Hygiène Appliquée à l'Homme et à son Environnement, Institut Pasteur de Lyon, October 1993.*

## FINLAND

### Phosphate-free detergents, washing performance and possible damage to washing machines

Several studies are being conducted in Finland to investigate the cause of growing concerns about possible side effects due to the use of phosphate-free detergents. These products are accused of bad washing performance and of damaging washing machines.

According to a report published by the Working Efficiency Institute in Finland, an alarming number of consumers have contacted the institute, looking for an explanation to the deterioration of washing results which has occurred during the last couple of years.

Consumers are complaining about the dust on the surface of textiles appearing even after an increased number of rinsings. These complaints correspond to the appearance of phosphate-free products on the detergents' market.

The Working Efficiency Institute in Finland started its own research program in cooperation with the Technical Research Centre of Finland (VTT) and the National Consumer Administration in order to investigate whether these worries are legitimate or not. The difficulty in rinsing out zeolite containing detergents has been highlighted by studies conducted by the National Consumer Administration (Konsumentverket) in Sweden and the international standardization organisation (IEC) which has developed methods for the definition of rinsibility of detergents.

Simultaneously, tests are being carried out by the Working Efficiency Institute in cooperation with washing machine maintenance experts. Their objective is to determine to what extent the formulation of detergents is responsible for the deterioration of washing machines. Both phosphate containing and phosphate free detergents have been tested.

This research started after serious concerns grew concerning the light coloured, limestone-like precipitation appearing on the inner surface of washing machines.

The full results of these studies will be available by the end of this year.

*Anneli Reisbacka, TEHO, 6/1993, published by the Working Efficiency Institute and RESEARCH NOTES, 11/1993, published by the National Consumer Administration.*

**SWITZERLAND**  
**NTA, EDTA and water quality**

**A Report On The Environmental Status of Winterthur (Switzerland) examines the presence of NTA and EDTA in water bodies of this area. NTA and EDTA were authorized as replacement to phosphates after the legislative restrictions introduced in 1986. It reveals that concentrations of EDTA go beyond water quality Targets for both ground and surface waters.**

The quality of the ground water of the valley of Eulach, (Eulachtal) was assessed. While having a higher concentration of chlorides and nitrates than the ground water of the Toess Valley (Tösstal), these values have been declining during the last two years. However, the threats result from other substances, particularly NTA (nitrilo-triacetic acid) and EDTA (ethylene diamine, tetra-acetic acid) which are synthetic products used in phosphate-free detergents' formulation.

Phosphates have been banned from detergents' formulation since 1986. Following this ban, the research program which surveys the environmental status of the area was extended to include NTA and EDTA. This decision was taken after experts emphasized problems related to phosphate substitutes and feared considerable risks and disadvantages. The quality target temporarily established for drinking water was 5 µg/l for both NTA and EDTA.

The additive EDTA is almost impossible to eliminate during the purification process at sewage plants and thus easily reaches surface water.

The permeation of EDTA into ground water by seeping from surface water is unavoidable. In the Töss river, a tributary of the Eulach river, a maximum value of 5.6 µg/l was previously recorded at the level of the Obere Au waterworks. The underlying ground water maximum was 2.1 µg/l.

At the Hard waterworks, on the Eulach river, the quality target in the ground water has already been exceeded with an established maximum of 7.6 µg/l. The reason for this is the seepage of the heavily polluted Töss river water through Kempt and Eulach. In the river itself, EDTA concentrations of up to 10 µg/l have been measured.

NTA causes fewer problems in regards to the quality of drinking water. The reason is that it can be more easily decomposed in the sewage plants and when passing along the floor of the river bed. The maximum concentrations previously recorded in the ground water were 1.9 µg/l at the Hard waterworks and 1.1 µg/l at Obere Au, e.g. significantly within the quality threshold.

*Umweltzustand 1992, Bericht der Fachkommission Umwelt und Energie an den Stadtrat, Winterthur.*

**OPINION SECTION**

Following the publication in the previous SCOPE NEWSLETTER of the article "The Effects of Polycarboxylate on the Uptake of Iron by 3 Marine Phytoplankton Species", we received a letter from BASF, a leading manufacturer of polycarboxylates for detergents, which questions the validity of some of the conclusions of the study mentioned. We publish in this issue the letter from BASF and the reply by the author of the study, Dr. U. Hortsman

**Comment from BASF :**

Polycarboxylates which are used in detergents are water-soluble linear polymers from acrylic acid and/or maleic acid. They have a dispersive effect in detergents and inhibit the crystal growth of calcium and magnesium salts. In contrast to complexing agents, due to their chemical structure, polycarboxylates are not capable of binding heavy metals. Claims to the contrary are based on studies with polymer compounds which have a different structure than that of the polycarboxylates used in detergents.

Further studies have shown that, after being used, polycarboxylates for detergents cannot remobilize heavy metals from the activated sludge or from the sediments in water.

**Reply from Dr U. HORSTMANN :**

In answer to the comment by BASF on our investigations we would like to state the following :

We have used in our experiments the polycarboxylate SOCOLAN CP 5 which is produced by BASF and used in detergents. We consider this polycarboxylate as a complexing agent due to its chemical structure, as do organic chemists.

We do not see any reason why the free reactive charges of polycarboxylate can not bind heavy metals. There is no doubt that the binding capacity is reduced after the washing process and after PCA has passed sewage treatment.

Unfortunately, little is known about the remaining capacity of PCA to bind heavy metals, nor about the complexing capacity for heavy metals due to different complexing affinities in the environment. It would be useful if BASF would support its statement that PCA cannot remobilize heavy metals from sludge with data from scientific investigations.

We explain our findings from iron with microalgae - and we have additional evidence with bacteria that SOCOLAN CP 5 acts apparently as an iron chelator, even at very low concentrations. The PCA-iron complex at the cell membrane is capable of providing iron, apparently via reductase, to the cells. Detailed results are now being prepared for publication.

The SCOPE Newsletter is produced by the SCIENTIFIC COMMITTEE ON PHOSPHATES IN EUROPE, a non commercial, non profit-making association (Association Sans But Lucratif) based in Brussels.

The association includes international groups headquartered in Belgium, France, Spain, Sweden and the UK, producers of a wide variety of detergent ingredients including phosphates. Its aim is to provide a platform for objective and scientific information on the effects of phosphate-containing and phosphate-free detergents on the environment.

The SCOPE Newsletter is open to input from its readers across Europe and we welcome all comments or information. Contributions from readers are invited on all subjects concerning phosphates, detergents, sewage treatment and the environment. You are invited to submit scientific papers for résumé, to send comments on the studies mentioned in this Newsletter or other scientific or technical news.

For each study or paper mentioned in the SCOPE Newsletter, the full document can be obtained directly from :

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**The effects of polycarboxylates on the uptake of iron by 3 marine phytoplankton species**  
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**Phosphate containing detergents and eutrophication**  
A study based on observations made from 1949 to 1991 in three lakes of the Zürich region questions the utility of the ban of phosphate from detergent products to reduce the eutrophication phenomenon. The conclusion of this study : ..... p. 5

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**Study of eutrophication in mesocosms**  
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## CANADA

### Signs of change in the Lake Ontario ecosystem

### The importance of maintaining a balanced food chain in the restoration of Lake Ontario

A report published jointly by the New-York Department of Environmental Conservation and the Ontario Ministry of Natural Resources implies that the ban of phosphates in detergents in areas bordering the North American Great Lakes could be partially responsible for the problems that authorities are facing in their effort to rehabilitate the populations of salmon and lake trout in lake Ontario.

Until recently, the history of man's involvement with Lake Ontario has been one of declining water quality and species diversity. Deforestation and the erection of barriers (which inhibited spawning) led to the disappearance of the Atlantic salmon in the late 1800's. Lake trout survived until the 1950's when pollution took its toll. The burbot population also declined to very low levels but survived overfishing and excessive predation. Since the 1950's, water quality has improved and large-scale re-stocking programmes have re-established the populations of salmon and trout. But now, these populations face a new threat.

These large species feed on smaller preys such as alewife and smelt which feed on zooplankton. The amount of zooplankton depends on the availability of phytoplankton that requires, like all plants, nutrients and sunlight to grow.

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Among these nutrients, the most critical limiting factor is phosphorus which stands at the beginning of the food chain and for this reason influences the size of the prey and predators.

Whereas in the early '70s, the reduced predation from these large species caused an explosion in alewife and smelt populations. This was accompanied by massive winter die-offs when food sources became scarce.

The reduced predation was failing to keep alewife and smelt populations in line with their sustainable food supply.

Today, there is evidence that the prey fish populations of the lake can no longer sustain the number of trout and salmon as they did five or ten years ago. A task group of scientists that studied the problem found that since the early 1980's, total phosphorus in the lake has declined by 25 %. This decrease has affected the production of zooplankton which has declined by 50 % in the upper water level during the same years.

Alewife suffer both from the lack of nutrients (zooplankton) and the pressure due to the large number of predators. Furthermore, an added complication is that the alewife population is also subject to stress due to cold temperatures during winters. A deficient food supply makes these small fish more vulnerable to the effects of cold temperatures.

This combination of different factors has led directly to an important decrease in the number of alewife.

In turn, this depletion provokes a higher level of stress among salmon and trout and may endanger the efforts made by authorities to rehabilitate these species. More globally, it jeopardizes the efforts made to restore the Lake Ontario ecosystem.

*Signs of change in Lake Ontario ecosystem, New-York Department of Environmental Conservation and Ontario Ministry of Natural Resources.*

<p style="text-align: center;"><b>FRANCE</b> <b>Phosphorus in marine ecology</b></p>
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Phosphate substitutes are among a number of products that inhibit the self regulation properties of the marine ecosystem. On the other hand, phosphates can be useful in the fight against oil spills.

It has been recently established that the biological balance of the marine environment depends on substances called tele-mediators. These substances, secreted by planktonic organisms, regulate the interaction between species. Some of them, like biotine, thiamin and vitamin B12 are mainly from bacterial origins and globally stimulate the growth of phytoplankton.

Other substances, mainly produced by diatoms, inhibit the growth of cells which themselves tend to limit the production of phytoplankton.

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The secretion of these substances by diatoms is altered and sometimes completely suppressed by pollutants coming from sewage, resulting in an increase in algal growth. Among these pollutants are pesticides, heavy metals, hydrocarbons and, in particular, substitutes used to replace phosphate in laundry detergents.

Organic matter, phosphates and nitrates are often accused of being responsible for the growth of plankton. Recent studies cited in the article show that there is no defined correlation between a high concentration of phytoplankton and a high level of these nutrients. Other elements like calcium, molybdenum, cobalt and iron may, on the other hand, have a significant impact on their proliferation.

The same article states that, in the fight against oil spills, studies show that water and marine sediments contain a wide variety of bacterial species, including some able to degrade oil constituents. The oil brings these bacteria an abundant source of carbon and energy, nitrogen and phosphorus being the main limiting factors.

When these nutrients are available, the oil degrading bacteria can develop quite rapidly and divide in a matter of hours.

The spreading over the ocean of selected or recombined bacteria to fight oil spills did not give the results expected. On the contrary, the enriching of sea water with sources of nitrogen or phosphate to feed existing bacteria showed spectacular results in the cleaning of the Alaskan coast after the Exxon-Valdez accident.

*Le phosphore en écologie marine, Senez J., Revue internationale d'océanographie médicale, vol. 107-108, 1992.*

## FRANCE

### **Evaluation of ecotoxicological impact of detergent effluents using laboratory microcosms**

**According to tests made in laboratory microcosms, the presence of P-containing and P-free detergents in effluents exhibit similar effects on photosynthesis activity and the production of chlorophyll A.**

Laboratory microcosms were used to measure acute ecotoxicity of detergent-containing effluents on aquatic ecosystems. Two dilutions of effluent were introduced in the microcosms (1/5 and 1/500). These effluents contained two types of laundry detergents, one with phosphates and one with zeolites.

Three classes of parameters were observed. They were physico-chemical (pH, dissolved oxygen, conductivity), structural community parameters (counts of populations) and functional parameters measured with energetic process such as respiration, photosynthesis or cellulolytic bacterial activity.

It emerges from this study that photosynthesis was affected by the higher concentration of laundry detergent regardless of the presence of phosphates or zeolites in the composition of the detergent diluted in the effluent.

No effect was observed with the lower concentration in terms of bioproduction.

At low dilution, the introduction of both types of effluent led to a drastic fall of dissolved oxygen due in part to restricted re-aeration caused by the establishment of a surfactant film at the air-water surface. After 10 days, the bacterial population raised significantly but both types of effluents had no incidence on the cellulolytic bacterial activity.

Ecotoxicity was observed on zooplankton as well as algae at high concentration. P-containing detergents were not responsible for an increase in macrophytes biomass. Only one vegetable species was affected at low concentration of both type of effluents.

Finally, the induction of detergent effluents at high dilution, especially the one containing phosphate, had no impact on the production of chlorophyll A.

The authors conclude that the acute toxic effect observed, probably due to surfactants, was more important than the nutrient effect and that no significant differences were observed between P-containing and P-free detergent effluents in terms of effects on the ecosystems.

*Merlin, Kilanda and Blake, Fresenius Envir Bull, 2 : 185-192 (1993)*

## GERMANY

### The effects of polycarboxylates on the uptake of iron by 3 marine phytoplankton species

**Polycarboxylates (PCA) used as co-bullder In Phosphate free detergents may act as a reservoir of iron when this element becomes limiting in the environment. In addition, Polycarboxylates stimulate Fe uptake by phytoplankton more than EDTA. They also enhance the growth of diatoms.**

The effect of polycarboxylates on the growth and iron uptake of phytoplankton was studied. This compound is a copolymer of maleic and acrylic acids which acts as a complexant. It is added to phosphate free washing agents as a cobuilder.

Among the three phytoplankton species studied, algae grown in a medium with Fe-PCA showed higher iron uptake than cells grown in a medium where Fe was complexed with EDTA. This difference became more pronounced with longer incubation time.

Two concentrations of PCA ( $30\mu\text{g.l}^{-1}$  and  $300\mu\text{g.l}^{-1}$ ) did not show varying effects as to Fe uptake by phytoplankton.

The growth of the marine diatoms, *Cyclotella cryptica*, was also enhanced in the presence of PCA. The growth curve of Fe-PCA treated cultures exceeded that of the control by more than 120 hours.

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IN EUROPE

Photomicrograms showed that not only phytoplankton Fe uptake was affected by PCA but also that of bacteria. The possibility of phytoplankton-bacterial competition for Fe is also discussed.

The mechanism of how PCA makes Fe more available to phytoplankton is not yet clear.

Previous studies conducted by the authors have shown that this compound binds Fe from the medium, thus it may act as a chelator. This PCA chelated iron may not be immediately used by phytoplankton but it may be made available after depletion of free iron present in the medium. In this case, the Fe-PCA complex may act as a reservoir of Fe necessary for growth.

PCA can bind Fe rather strongly and maintain it in the environment in a form available for algal growth when iron becomes limiting. The role of these synthetic chelators becomes more important in the marine environment where humic substances are relatively poor chelators. Furthermore, they bind less with metal when salinity increases.

It is also suggested that the presence of other ions in the environment may promote the deferration of Fe-PCA, making Fe more available for phytoplankton growth.

*Soria-Deng, Horstman, Institut für Meereskunde, Kiel, 1993.*

## SWITZERLAND Phosphate containing detergents and eutrophication

**A study based on observations made from 1949 to 1991 in three lakes of the Zürich region questions the utility of the ban of phosphate from detergent products to reduce the eutrophication phenomenon. The conclusion of this study :**

"There is no doubt that there has been a clear intensification of the eutrophication processes in the large Alpine foothills lakes. The increase of human activities, i.e. the greater loading of nutrients and other substances in the lakes are responsible for this.

Looking at the successes of various measures to reduce the phosphorus loading up to now, it is clear that a reduction of the bioproductivity is usually obtained only when the annual mean value of total phosphorus compounds is less than 5 µg/l P.

The hope of improving lake water quality by lowering the phosphorus should not distract the water works from improving their treatment processes in such ways that all imaginable reactions of the lake can be coped with successfully and the degree of safety in providing drinking water can be increased.

The statements made above in no way mean that, from the point of view of drinking water supply, further water protection measures are not required and not wanted.

The results of this investigation show, however, that more care has to be taken in the future to do the right thing. The question should be raised whether or not the current demand for advanced waste-water treatment processes and for regulations leading to a lowering of the phosphorus loading in the lakes are still justifiable beyond a certain degree.

This, particularly since there are additional substances present in the waste-waters which can be degraded only with difficulty or not at all. Moreover, phosphate is a natural substance which, present in small amounts, brings no disadvantages to treated drinking water. In fact, functioning as a corrosion-inhibitor, it even provides advantages.

This necessarily means that there is very little reason to replace phosphate in detergents or other commercial products by synthetic substances, whose effects on the environment are not sufficiently well known. Such relatively unknown substances could have effects both on the drinking water and on the aquatic ecology.

This statement is particularly valid for a country where practically all waste-waters entering a lake are treated in sewage treatment plants with phosphate removal. In other, more severe cases of eutrophication, a phosphate ban could be used as a temporary measure".

*"Long term changes on water quality in three Swiss lakes", by U. ZIMMERMANN, R. FORSTER and H. SONTHEIMER, published by Zurich Water Supply, Switzerland, 1991".*

## **SPAIN**

### **Study of Eutrophication in mesocosms**

**A study of Eutrophication In mesocosms shows that phosphate-free detergents induce a faster and greater algal growth than those containing phosphate.**

A series of seven experiments have been installed in an oligotrophic-mesotrophic water body (Amadorio reservoir) in the province of Alicante (Spain), by a research team from the University of Alicante, in collaboration with BETURE-SETAME from Paris.

The purpose of these experiments was to evaluate both modification in phytoplanktonic biomass and population equilibrium due to different sewage treatments and compositions (with P-containing or P-free detergents).

One of the most interesting results is that the sewage with phosphate-free detergents yields a faster and greater algal production (number of cells and chlorophyll) than the sewage with detergents containing phosphate.

Three experiments were particularly relevant :

- the comparison of the impact of raw sewage vs. the same sewage biologically treated,

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- the comparison of the impact of raw sewage vs. two samples of reconstructed sewage respectively completed with P-free and P-containing detergents,

- the comparison of the same samples as in the previous experiment but all of them being treated by physico-chemical sedimentation process.

Natural water from the reservoir was maintained in three 4500 litre enclosures (mesocosms) anchored into the reservoir. The water confined in each of these mesocosms was spiked with a known and monitored amount (1 % v/v) of the above sewage. These experiments were each conducted during a 20 day period.

They allowed the authors to come to the following conclusions :

- The mesocosm methodology was proved to be valid in comparing effects of different dilutions in a natural body of water.

- There is no clear relationship between P enrichment and biomass, nor between biomass and population structure.

- The P-free detergents enhance the algal growth velocity and the total number of cells is greater too.

- Biological treatment of sewage is not sufficient for preventing significant growth of algae in the reservoir, however the chemical process of flocculation produced effective results.

- The distribution within species was homogeneous throughout the experiments, in all the different mesocosms.

New research has already begun in which some of the most significant experiments are planned to be repeated under different environmental conditions.

*This information is extracted from a summary report of a presentation at the 1992 International Congress of Limnology in Barcelona, Spain. The authors of the study are, HERNANDEZ, P.; PRATS, D.; FERRANDIS, E and CROUZET, P.*

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The contribution of detergent phosphates to the total cadmium load on the sewage treatment works is estimated at 1 - 2 % (cadmium is a natural impurity in the raw materials used in the manufacture of sodium tripolyphosphate).

Regarding chemicals used in phosphate-free detergents, the paper estimates that a complete change to such detergents would result in zeolites making up 5 % of residual sludge dry weight. Sludge volumes would increase and their fertilizer value would be reduced.

The paper notes that chelating polymers, such as PCA used in phosphate-free detergents, are difficult to degrade but non-toxic. The environment is exposed to these products through sewage works outflow and agricultural spreading of sludge. The paper suggests that the significance of chelating polymers in the transport and concentration of heavy metals, as well as their biological persistence, need to be investigated.

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In conclusion, Stockholm Water Authority considers that a long term objective should be the replacement of phosphates (a limited natural resource) with environmentally innocuous substitutes. At present, however, no adequate alternatives to phosphate are currently available and it would be inappropriate to

introduce phosphate-free products on a wide scale for laundry detergents, dishwasher detergents or other cleaning products.

"Load and treatment capacity for phosphorus, phosphates and phosphate substitutes at the Henriksdal Sewage Works", Urban Jonsson, Stockholm Vatten AB.

*Water Treatment Authority Information, 4th November 1992.*  
*English translation available from SCOPE.*

<p style="text-align: center;"><b>UNITED KINGDOM</b> <b>"Snapshot" study of EDTA</b> <b>and NTA in rivers</b></p>
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**UK study suggests that aquatic NTA and EDTA concentrations are currently low enough not to mobilise metal ions but raises questions over NTA in sewage sludge.**

The UK Department of the Environment has commissioned a "snapshot" determination of nitrilotriacetic acid (NTA) and ethylenediaminetetracetic acid (EDTA) contents in river waters, sewage works outflow effluents and sewage works sludges.

This study was carried out in Spring 1992 by the government's Warren Spring Laboratory research station and was published early in 1993.

Mean NTA concentrations were below the detection limit in relatively unpolluted rivers (class 1 and 2), 16 µg/l in class 3 rivers. Mean EDTA concentrations were 6-7 µg/l in class 1 rivers, 28 µg/l in class 2 rivers and 57 µg/l in class 3 rivers.

The results from these 46 lakes do not allow a clear judgement to be made about the effectiveness of phosphorus reduction strategies. In many cases, this is because of phosphorus release from lake sediments, occurring particularly at critical seasonal intervals. Phosphorus, in lakes studied, in Sweden, is absorbed into sediments at the end of the summer algal growth period, and is thus not washed out of the lake by winter rainfall.

The study also points out the significant and complex rôle of lake nitrogen inputs. Reductions in artificial nitrogen input can stimulate the appearance of blue-green nitrogen-fixing algae or accentuate the release of phosphorus by lake sediments.

The authors conclude that advanced wastewater treatment where phosphorus is removed from sewage is today the major strategy for lake restoration but that experience shows that the success of such a strategy depends on limnological understanding of the water bodies involved.

*Hydrobiologica n° 170 (1988). Peter Cullen, Curt Forsberg. Canberra College Water Research Centre, PO Box 1, Belconnen ACT 2616, Australia.*

*Uppsala University Limnology Institute, Box 557, 75122 Uppsala, Sweden.*

**JAPAN**  
**Phosphate removal, magnesium,  
crystallisation**

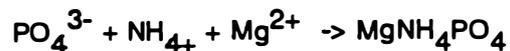
**A new process allows removal of phosphates from industrial wastewater in the form of solid magnesium ammonium phosphate usable for fertiliser.**

The Japanese company UNITIKA Ltd. has developed

a new process, called the Phosnix process, for the removal of phosphates from wastewater.

The addition of magnesium ions to wastewater at a controlled pH level provokes a reaction with phosphate and ammonium ions to form fine white crystals of magnesium ammonium phosphate. These crystals then agglomerate in large crystal clusters which can be easily removed from wastewater.

The reaction that occurs can be illustrated by the following equation :



The phosphorus removal process is more effective at a high pH and high ammonium concentration level. 95% of the phosphorus content can be removed when the amount of ammonium is 300 mg/l at pH 9.0.

Also the phosphorus removal increases with the amount of magnesium introduced ; the rate of increase diminishes when the mg/l ratio reaches 1.3.

Despite the fact that the ammonium content varies from 430 to 620 mg/l in industrial wastewater, the results obtained are quite similar to those calculated with theoretical samples.

The Phosnix process takes place in a single tank where water is fed with a magnesium solution and a pH adjusting agent. With agitation by injection of air, the crystallisation process is completed within ten minutes.

The crystals formed have a size of 0.4 to 3 mm and

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The article is entitled "Mucilage in the Italian seas : must we review our anti-eutrophication strategy ?"

Macroscopic aggregates can result either from purely biological processes or from mixed mineral-biological processes. In the first case, a dominant organism (algae or bacteria) excrete esopolymers, for example polysaccharides, in order to hold together or protect colonial development. In the second case, physical aggregation of colloidal particles present in sea water is accentuated by biological actions which modify the size and properties of the colloidal particles : the particles are generally minerals such as clays and metal hydroxides more or less linked to organic molecules such as humic acids or proteins.

Mucilage phenomena occur naturally in Italian coastal waters and have been recorded as early as the ninth century. However, over the past few years, the problem has reached abnormally high levels of proliferation : in terms of frequency of occurrences, of dimensions of the mucilage aggregations, and a greater tendency for mucilage to float to the surface of the sea as they age.

Mucilage scum slicks have recently caused major problems for tourism in the Northern Adriatic, affecting leading tourist resorts during several consecutive summers. No dominant organism has been identified in relation to these mucilage phenomena and it is thought that they are of mineral-biological cause. The authors note that this worsening of a natural phenomenon suggests that some additional factor, caused by man, is interacting with natural factors.

The authors underline the fact that these abnormal mucilage proliferations increased after the introduction of legislation limiting and then banning phosphates in domestic laundry detergents in Italy from 1986 and suggest that the phenomenon may be related to the introduction of zeolites and polycarboxylic acids (used as phosphate substitutes in P-free detergents).

The authors point out that zeolites are themselves colloidal materials capable of participating in the aggregation process, which leads to the formation of "sea snow", as do natural colloids such as clay, and that polycarboxylates are macro-molecular compounds which can contribute to the coagulation-flocculation process as well as or more effectively than natural polymers, such as humic and fulvic acids, on which mucilage aggregates are generally based.

The presence of zeolites is estimated to represent an increase of 10-40 % in the concentration of fine colloidal particles in Adriatic coastal waters. The authors further suggest that aggregates formed around zeolites are likely to be less dense than those formed with natural clays, because of zeolites' low density and high porosity, thus causing aggregates to float to the surface and cause problems. Zeolites may also tend to limit sedimentation of aggregates.

The authors conclude : "The general characteristics of the synthetic zeolites-polycarboxylic acids system (used in phosphate-free detergents) can be summarised as an increase in the concentration of colloidal particles, an increased residence time of the flocculates produced and an increase in the colloids' surface reactive properties".

Phosphate is recovered as a calcium phosphate / calcium carbonate by-product. The  $P_2O_5$ -content depends on the phosphate concentration in the water before treatment.

Magnetic phosphate removal is based on the binding of calcium phosphate / calcium carbonate on the surface of magnetite, a magnetisable carrier material with a mean particle size of c. 40 micron.

The magnetisable flocs are separated out efficiently with a specially developed electromagnet (flows larger than c. 30 m<sup>3</sup>/h) or with a disc separator with permanent magnets of the rare earth type (flows smaller than c. 30 m<sup>3</sup>/h).

Both magnetic separation techniques have been developed by ENVIMAG BV.

After separation, the magnetite is recovered for re-use by a mechanical disruption of the flocs and a selective magnetite separation by means of a magnetic drum separator. The residual sludge has to be dewatered before it is introduced as a raw material in industry.

The advantages of magnetic phosphate removal are :

- . High treatment efficiency  
(P-concentration  $\leq 0.5$  mg/l)
- . By-product with potential re-use
- . Compact
- . Easy to operate
- . Low total electricity demand, less than  
0,1 kWh/m<sup>3</sup>
- . No clogging by oversized particles.

*Article submitted by :*  
*Dr. A.F.M. van Velsen*  
*ENVIMAG BV - PO Box 9107*  
*6500 HJ Nijmegen - Holland.*

**FRANCE**  
**Comparative washing efficiency study**  
**for dishwashing detergents**

**French national consumer institute study of 15 hand and 8 machine dishwashing detergents.**

In a consumer report published in the institute's magazine "50 Millions de Consommateurs", the French national consumer institute INC states that only 10 of the 23 dishwashing detergents tested provide high quality performance (5 out of 15 products for handwashing and 5 out of 8 machine products).

The report notes that the "Green" products tested offered only poor performance.

The report includes detailed analyses of the chemical components of the products tested and a full description of the testing methods applied (based on real food soiling).

All the machine products tested contained 10-25 phosphates, considered by INC as "very useful for softening the water and for preventing redeposition of soil and dirt".

The report points out that polyphosphates (complexing agents) also "favour cleaning, in particular trapping of soils" under the alkaline conditions at which machine dishwashing detergents function.

The functioning of these telemediators can be modified or completely nullified by various pollutant chemicals present in sewage effluents, in particular ingredients used in phosphate-free detergents.

Professor SENEZ suggests that the rôle of such chemicals in causing marine algal imbalances is probably as significant as that of terrestrial nutrient inputs.

Professor SENEZ' paper also looks at current knowledge regarding biodegradation of oil slicks in the marine environment, concluding that local nutrient availability is often the limiting factor in the decomposition process (breakdown by naturally occurring bacteria or artificially introduced micro-organisms). Fertilisation with nitrogen and phosphates in an oil-soluble medium has already proved to be effective in accelerating the breakdown of crude oil pollution at sea.

*Full copy of Professor SENEZ' paper "Phosphorus in Marine Ecology" available in French from SCOPE. Proceedings of the IMPHOS (Institut Mondial du Phosphate) - Gand, Belgium, 8-11 September 1992 - available from IMPHOS : 19 rue Hamelin - 75016 Paris - France.*

**HOLLAND**  
**A new appraisal of marine eutrophication**

**Mesocosm experiments confirm that because of effects on algae grazers (zooplankton), algal biomass levels in coastal waters are more sensitive to toxic pollution than to nutrient inputs.**

Eutrophication of coastal waters is a major cause for environmental concern.

Increased nutrient availability is seen as the driving force behind eutrophication, but algae dynamics are also regulated by grazing.

Adverse consequences of eutrophication are related to an excess of algal biomass (ie. non-grazed algae) rather than to an increased algal production. On the contrary, algal production is the basis for the productivity of the marine ecosystem and is thus potentially beneficial. Algal biomass can be regulated as long as the capacity of grazing is not exceeded by algal production.

Algal production in marine coastal waters is mainly controlled by nitrogen, whereas algal (phytoplankton) biomass is also controlled by zooplankton grazing. Macroalgae blooms are generally based on mineralisation of nitrogen from sedimented phytoplankton. Generally, increased nitrogen availability does not remove the nitrogen limitation but does stimulate coastal algal production whereas increased phosphate availability does not enhance this production.

Zooplankton can rapidly respond to extra food production by increasing their numbers. However, zooplankton (viz. copepods) are amongst the most sensitive biota to toxic contaminants. Contaminant exposure leads to reduced zooplankton (re)production. In a non-toxic environment, zooplankton will transfer any excess of algal production into the marine food web, becoming themselves a food source for many marine biota such as otenophores, planktivorous fish or even whales (krill).

Eutrophication phenomena occur principally within 10 km of coasts where large concentrations of nutrients are released by river outflows and land runoff, in particular from the Rhine-Meuse river system which contributes about 80 % of the total river flow entering the North Sea from the Netherlands and can make up 10 % of total coastal water volumes.

Phosphorus inputs to the North Sea from the Rhine-Meuse have fallen significantly in recent years - 50 % from the 1981 peak to 1990. However, 1990 inputs are still around 7 times higher than in 1935.

Nitrogen inputs were reduced in 1989 and 1990 as a result of lower river water flows and were around 4 times higher in 1990 than in 1935. In general, however, nitrogen and silicate inputs have not fallen significantly over the last decade.

Nutrient concentrations in coastal waters would appear to have responded as a function of these inputs. Ortho-phosphate concentrations in 1990 were comparable with 1976 levels, whereas no significant trend can be detected for nitrate or silicate concentrations.

The report emphasises that average chlorophyll production would not appear to have responded to changes in phosphate concentrations and that 1990 levels were similar to those of 1985.

Both climatic conditions and grazing by microzooplankton, on the other hand, do appear to have considerable impact on the total planktonic community.

*"Eutrophication of the North Sea in the Dutch coastal zone 1976-1990", March 1992  
Tidal Waters Division, Ministry for Transport  
Public Works and Water Management  
PO Box 20907 - 2 500 The Hague - Holland.*

## **SWITZERLAND**

### **Climatic conditions result in continuing decline in Lake Geneva's deep-water oxygen levels**

**Significant reductions have been achieved in phosphate concentrations in Lake Geneva but climatic conditions in 1991 and 1992 have resulted in significant algal blooms and falling deep-water oxygen levels.**

The CIPEL (Commission Internationale pour la Protection des Eaux du Léman) has published a series of reports and studies regarding the evolution of the quality of Lake Geneva's waters in 1991-1992 (regular annual publication).

The published studies cover climate, physical and chemical water quality, pollutants, phytoplankton, zooplankton, worm populations and sewage treatment.

Considerable efforts have been made to reduce nutrient inputs to Lake Geneva since 1973, when phosphate removal began to be put into place in sewage treatment works around the lake. In 1991, phosphate removal was in place in 110 of the 214 sewage works in the lake's catchment area. In 1986, phosphate-containing detergents were banned in part of the Lake's catchment area (in Switzerland but not in France). Actions have also been undertaken to reduce agricultural run-off.

Eutrophication phenomena occur principally within 10 km of coasts where large concentrations of nutrients are released by river outflows and land runoff, in particular from the Rhine-Meuse river system which contributes about 80 % of the total river flow entering the North Sea from the Netherlands and can make up 10 % of total coastal water volumes.

Phosphorus inputs to the North Sea from the Rhine-Meuse have fallen significantly in recent years - 50 % from the 1981 peak to 1990. However, 1990 inputs are still around 7 times higher than in 1935.

Nitrogen inputs were reduced in 1989 and 1990 as a result of lower river water flows and were around 4 times higher in 1990 than in 1935. In general, however, nitrogen and silicate inputs have not fallen significantly over the last decade.

Nutrient concentrations in coastal waters would appear to have responded as a function of these inputs. Ortho-phosphate concentrations in 1990 were comparable with 1976 levels, whereas no significant trend can be detected for nitrate or silicate concentrations.

The report emphasises that average chlorophyll production would not appear to have responded to changes in phosphate concentrations and that 1990 levels were similar to those of 1985.

Both climatic conditions and grazing by microzooplankton, on the other hand, do appear to have considerable impact on the total planktonic community.

*"Eutrophication of the North Sea in the Dutch coastal zone 1976-1990", March 1992  
Tidal Waters Division, Ministry for Transport  
Public Works and Water Management  
PO Box 20907 - 2 500 The Hague - Holland.*

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The functioning of these telemediators can be modified or completely nullified by various pollutant chemicals present in sewage effluents, in particular ingredients used in phosphate-free detergents.

Professor SENEZ suggests that the rôle of such chemicals in causing marine algal imbalances is probably as significant as that of terrestrial nutrient inputs.

Professor SENEZ' paper also looks at current knowledge regarding biodegradation of oil slicks in the marine environment, concluding that local nutrient availability is often the limiting factor in the decomposition process (breakdown by naturally occurring bacteria or artificially introduced micro-organisms). Fertilisation with nitrogen and phosphates in an oil-soluble medium has already proved to be effective in accelerating the breakdown of crude oil pollution at sea.

*Full copy of Professor SENEZ' paper "Phosphorus in Marine Ecology" available in French from SCOPE.*

*Proceedings of the IMPHOS (Institut Mondial du Phosphate) - Gand, Belgium, 8-11 September 1992 - available from IMPHOS : 19 rue Hamelin - 75016 Paris - France.*

**HOLLAND**  
**A new appraisal of marine eutrophication**

**Mesocosm experiments confirm that because of effects on algae grazers (zooplankton), algal biomass levels in coastal waters are more sensitive to toxic pollution than to nutrient inputs.**

Eutrophication of coastal waters is a major cause for environmental concern.

Increased nutrient availability is seen as the driving force behind eutrophication, but algae dynamics are also regulated by grazing.

Adverse consequences of eutrophication are related to an excess of algal biomass (ie. non-grazed algae) rather than to an increased algal production. On the contrary, algal production is the basis for the productivity of the marine ecosystem and is thus potentially beneficial. Algal biomass can be regulated as long as the capacity of grazing is not exceeded by algal production.

Algal production in marine coastal waters is mainly controlled by nitrogen, whereas algal (phytoplankton) biomass is also controlled by zooplankton grazing. Macroalgae blooms are generally based on mineralisation of nitrogen from sedimented phytoplankton. Generally, increased nitrogen availability does not remove the nitrogen limitation but does stimulate coastal algal production whereas increased phosphate availability does not enhance this production.

Zooplankton can rapidly respond to extra food production by increasing their numbers. However, zooplankton (viz. copepods) are amongst the most sensitive biota to toxic contaminants. Contaminant exposure leads to reduced zooplankton (re)production. In a non-toxic environment, zooplankton will transfer any excess of algal production into the marine food web, becoming themselves a food source for many marine biota such as otenophores, planktivorous fish or even whales (krill).

Phosphate is recovered as a calcium phosphate / calcium carbonate by-product. The  $P_2O_5$ -content depends on the phosphate concentration in the water before treatment.

Magnetic phosphate removal is based on the binding of calcium phosphate / calcium carbonate on the surface of magnetite, a magnetisable carrier material with a mean particle size of c. 40 micron.

The magnetisable flocs are separated out efficiently with a specially developed electromagnet (flows larger than c. 30 m<sup>3</sup>/h) or with a disc separator with permanent magnets of the rare earth type (flows smaller than c. 30 m<sup>3</sup>/h).

Both magnetic separation techniques have been developed by ENVIMAG BV.

After separation, the magnetite is recovered for re-use by a mechanical disruption of the flocs and a selective magnetite separation by means of a magnetic drum separator. The residual sludge has to be dewatered before it is introduced as a raw material in industry.

The advantages of magnetic phosphate removal are :

- . High treatment efficiency  
(P-concentration  $\leq 0.5$  mg/l)
- . By-product with potential re-use
- . Compact
- . Easy to operate
- . Low total electricity demand, less than  
0,1 kWh/m<sup>3</sup>
- . No clogging by oversized particles.

*Article submitted by :*  
*Dr. A.F.M. van Velsen*  
*ENVIMAG BV - PO Box 9107*  
*6500 HJ Nijmegen - Holland.*

## **FRANCE**

### **Comparative washing efficiency study for dishwashing detergents**

**French national consumer institute study of 15 hand and 8 machine dishwashing detergents.**

In a consumer report published in the institute's magazine "50 Millions de Consommateurs", the French national consumer institute INC states that only 10 of the 23 dishwashing detergents tested provide high quality performance (5 out of 15 products for handwashing and 5 out of 8 machine products).

The report notes that the "Green" products tested offered only poor performance.

The report includes detailed analyses of the chemical components of the products tested and a full description of the testing methods applied (based on real food soiling).

All the machine products tested contained 10-25 phosphates, considered by INC as "very useful for softening the water and for preventing redeposition of soil and dirt".

The report points out that polyphosphates (complexing agents) also "favour cleaning, in particular trapping of soils" under the alkaline conditions at which machine dishwashing detergents function.

The article is entitled "Mucilage in the Italian seas : must we review our anti-eutrophication strategy ?"

Macroscopic aggregates can result either from purely biological processes or from mixed mineral-biological processes. In the first case, a dominant organism (algae or bacteria) excrete esopolymers, for example polysaccharides, in order to hold together or protect colonial development. In the second case, physical aggregation of colloidal particles present in sea water is accentuated by biological actions which modify the size and properties of the colloidal particles : the particles are generally minerals such as clays and metal hydroxides more or less linked to organic molecules such as humic acids or proteins.

Mucilage phenomena occur naturally in Italian coastal waters and have been recorded as early as the ninth century. However, over the past few years, the problem has reached abnormally high levels of proliferation : in terms of frequency of occurrences, of dimensions of the mucilage aggregations, and a greater tendency for mucilage to float to the surface of the sea as they age.

Mucilage scum slicks have recently caused major problems for tourism in the Northern Adriatic, affecting leading tourist resorts during several consecutive summers. No dominant organism has been identified in relation to these mucilage phenomena and it is thought that they are of mineral-biological cause. The authors note that this worsening of a natural phenomenon suggests that some additional factor, caused by man, is interacting with natural factors.

The authors underline the fact that these abnormal mucilage proliferations increased after the introduction of legislation limiting and then banning phosphates in domestic laundry detergents in Italy from 1986 and suggest that the phenomenon may be related to the introduction of zeolites and polycarboxylic acids (used as phosphate substitutes in P-free detergents).

The authors point out that zeolites are themselves colloidal materials capable of participating in the aggregation process, which leads to the formation of "sea snow", as do natural colloids such as clay, and that polycarboxylates are macro-molecular compounds which can contribute to the coagulation-flocculation process as well as or more effectively than natural polymers, such as humic and fulvic acids, on which mucilage aggregates are generally based.

The presence of zeolites is estimated to represent an increase of 10-40 % in the concentration of fine colloidal particles in Adriatic coastal waters. The authors further suggest that aggregates formed around zeolites are likely to be less dense than those formed with natural clays, because of zeolites' low density and high porosity, thus causing aggregates to float to the surface and cause problems. Zeolites may also tend to limit sedimentation of aggregates.

The authors conclude : "The general characteristics of the synthetic zeolites-polycarboxylic acids system (used in phosphate-free detergents) can be summarised as an increase in the concentration of colloidal particles, an increased residence time of the flocculates produced and an increase in the colloids' surface reactive properties".

The SCOPE Newsletter is produced by the SCIENTIFIC COMMITTEE ON PHOSPHATES IN EUROPE, a non commercial, non profit-making association (Association Sans But Lucratif) based in Brussels.

The association includes international groups headquartered in Belgium, France, Spain, Sweden and the UK, producers of a wide variety of detergent ingredients including phosphates. Its aim is to provide a platform for objective and scientific information on the effects of phosphate-containing and phosphate-free detergents on the environment.

The SCOPE Newsletter is open to input from its readers across Europe and we welcome all comments or information. Contributions from readers are invited on all subjects concerning phosphates, detergents, sewage treatment and the environment. You are invited to submit scientific papers for résumé, to send comments on the studies mentioned in this Newsletter or other scientific or technical news.

For each study or paper mentioned in the SCOPE Newsletter, the full document can be obtained directly from :

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# SCOPE NEWSLETTER

IN EUROPE

Number Six - October 1992

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## EDITORIAL

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You are invited to submit scientific papers for  
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mentioned in this Newsletter or other scientific or  
technical news.

For each study or paper mentioned in the SCOPE  
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SCOPE is a non-commercial, non-profit making European association based in Brussels.

Its aim is to provide a platform for objective and scientific information on the effects of phosphate-containing and phosphate-free detergents on the environment.

SCOPE NEWSLETTER

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**UNITED KINGDOM**  
**Cost/benefit analysis of sewage**  
**phosphate removal**

**A FORTHCOMING REPORT FROM  
IMPERIAL COLLEGE, LONDON, ASSESSES  
COSTS AND ENVIRONMENTAL BENEFITS  
OF EC SEWAGE TREATMENT POLICY**

A forthcoming report from the Environmental Engineering Laboratory at Imperial College, London, reviews the level and status of wastewater treatment in the European Community and assesses the likely economic and environmental impact of phosphorus removal techniques across the Community.

The report concludes that an effective nutrient management policy should target phosphorus from all sources - human and agricultural as well as detergent - and that the most cost-effective option is generally P-removal from wastewater at sewage treatment works.

Many countries have nonetheless not invested sufficiently in sewage P-removal but this situation is changing as a result of international objectives and measures defined by the EC Urban Wastewater Directive and the Rhine Action Plan. Agricultural sources, which represent a large if uncertain contribution (around 50 % of all P inputs to surface waters), have not been adequately targeted in any country.

Those countries which have based their nutrient management policy primarily upon removal of phosphates from detergents have failed to see any improvement in water quality.

The report assesses the costs involved in P-removal from wastewater using different techniques : chemical pre- and simultaneous precipitation and biological removal. Key economic factors are capital costs, chemicals used and sludge disposal prices. (Editor's note : techniques enabling P-recycling avoid sludge volume increases and disposal costs, as demonstrated by the pellet-reactor developed in Holland, for example).

The authors' preliminary calculations suggest that a total annual expenditure of ECU 700 million (£500 million) would be sufficient to ensure wastewater P-removal in likely sensitive areas across the EC (serving an estimated 200 million people) ie. around ECU 2.1 (£1.50) per person. In a longer term scenario of complete P-removal the total cost would increase to ECU 1 100 million (£800 million). The above costs exclude potential agricultural benefits (estimated at ECU 50 million) from phosphorus recycling in sewage sludge and excludes benefits from the re-use of industrial waste streams as treatment chemicals.

However, the extent of sewage collection and treatment systems within the Community is very variable and at present only about 2/3 of the P-removal required could actually be implemented. The other 1/3 awaits essential underlying investment in collection and treatment systems.

The preliminary costs estimated for wastewater P-removal are comparable to 0,3 % of EC income from tourism and leisure. Therefore, if problems associated with eutrophication do indeed impact tourism and leisure to any significant extent, investment in P-removal could be justified on these grounds alone.

# SCOPE NEWSLETTER

IN EUROPE

If P-based detergents were widely used across Europe, the cost of phosphate removal would equate to about 4 % of detergent sales turnover. Current market data would suggest that consumers in the UK are currently paying a 10 % premium for Phosphate-free detergents. P-removal in wastewater is therefore considered to be a much better deal for the consumer than the use of "P-free" detergents, particularly given the other advantages of tertiary wastewater treatment and the disadvantages associated with chemicals used in "P-free" detergents (production waste streams, increases in sewage sludge generation, impact on sludge incineration for Zeolite A ; non-biodegradability and unknown environmental fate of PCA and PCA-metal complexes).

*Preliminary findings/forthcoming report :*  
G. Morse, J. Lester, Prof. Roger PERRY  
Environmental Engineering Laboratory  
Imperial College  
LONDON SW7 2 BU

## UNITED KINGDOM

### Management of planktonic algae

## PHOSPHORUS REDUCTION IS NOT ALWAYS THE BEST APPROACH TO EUTROPHICATION PROBLEMS

Dr Reynolds, Scientific Adviser to the UK Freshwater Biological Association (FBA) has recently reviewed current approaches to eutrophication and the management of planktonic algae, in a paper presented to a joint meeting of the International Water Supply Association and the FBA.

conclusions warn against blind reliance on

regression models relating mean algal biomass in a series of lakes to their mean phosphorus concentrations as an index to how any one of them will behave.

In particular, are emphasised : the need to distinguish between algal growth rate limitation and total biomass production capacity ; the mechanisms in internal nutrient recycling ; availability of nutrients in sediments ; use of physical or biotic control methods.

Dr. Reynolds is critical of attitudes implicit in many current approaches to eutrophication problems :

- . phosphorus should not be regarded as a pollutant, but rather as a scarce life-supporting element requiring balanced management. He emphasises that addition of phosphate might benefit certain acidified waters in North Europe, offering a key to lasting biological recovery
- . supported biomass does not necessarily respond smoothly and proportionately to changes in P-loading. This is the case only in certain specific circumstances
- . reductions in P-loading will not automatically influence algal abundance or species composition. Other management techniques would often be considerably more appropriate.

*"Eutrophication : research and application to water supply", the proceedings of the joint meeting, will be published shortly by the Freshwater Biological Association : the Ferry House - Far Sawrey - Ambleside - Cumbria LA22 0LP, UK*

**FRANCE**  
**Coastal "green slicks" are  
due to nitrate pollution**

**BRITANNY : REDUCTIONS IN NITRATE  
INPUT TO COASTAL WATERS ARE THE KEY  
TO PREVENTING ALGAL PROLIFERATION**

Britanny's tourist beaches are suffering from eutrophication resulting in algal proliferation, locally named "green slicks" or "green salad". The principal algae concerned are green ulva and recently brown *pylaïella*.

Studies carried out over several years by the IFREMER (Institut Français de Recherche pour l'Exploitation de la Mer) and the CEVA (Centre d'Etudes et de Valoriation des Algues) have demonstrated that the algal proliferation results from nitrate fluxes in some bays. The removal of phosphorus does not improve the situation. P-removal has been widely introduced for urban sewage treatment in the area without result.

The annual input of nitrates into Britanny's coastal waters is estimated at 150-200 000 tonnes/year.

The studies carried out in the area underline the difficulty of predicting patterns of algal proliferation. Green algae tend to develop mainly on beaches, rather than on rocks or at sea. Growth is influenced by currents, tides and bay shapes (causing non-mixing of water), weather and the type of soil in catchment areas (affecting nutrient release).

The Institute's conclusions concerning the absence

of a relationship between phosphorus inputs and algal proliferation apply to coastal waters but cannot be extrapolated to inland water bodies.

*IFREMER - ZI Pointe du Diable, BP 70, 29280 PLOUZANE, France*  
*"Ulva biomass fluctuations in the Bay of Saint-Brieuc, North Brittany, France". Report available from SCOPE*

**DENMARK**  
**Nutrient run-off management**

**SEWAGE SOURCES MEET  
GOVERNMENT OBJECTIVES**

A report on "Eutrophication of Coastal Waters" published by Funen County Council, Denmark, assesses progress made towards achieving reductions in nutrient run-offs to surface waters.

The objectives defined by the Danish Parliament in 1987 (Aquatic Environment Plan) imply reductions of 50 % and 80 % respectively in nitrogen and phosphorus loads.

The Funen County Council report demonstrates that these targets will be met for municipal and industrial sewage treatment by the end of 1992. This will be achieved by improving collection networks, upgrading treatment works and, in certain areas, adding phosphate removal or denitrification facilities.

However, the report states that : "with respect to agriculture, there is no prospect that the reduction of nitrogen and phosphorus loads to the levels set in the Aquatic Environment Plan will be achieved".

# SCOPE NEWSLETTER

IN EUROPE

A number of measures to reduce nutrient run-off from agriculture are outlined and a three-year extension of the Aquatic Environment Plan deadline date is suggested.

Overall, the Funen County Council report, largely representative of the situation in most lowland countries, demonstrates clearly that the key to resolving eutrophication problems now lies with agriculture, given that techniques for removing nutrients from sewage are both tried, tested and readily applicable.

*"Eutrophication of Coastal Waters - Coastal Water Quality Management in the County of Funen, Denmark, 1976-1990". Funen County Council Department of Technology and Environment. Copy of report conclusions available from SCOPE.*

## UNITED KINGDOM Phosphorus from fish farms

### PHOSPHORUS POLLUTION COSTS ESTIMATED AT 3 % OF WHOLESALE VALUE OF FISH PRODUCED

A report published recently by the UK Department of Agriculture (Northern Ireland) looks at the production of phosphorus pollution by trout farms, assessing the evolution of quantities produced, the different forms of phosphorus released and their economic and environmental implications.

The phosphorus content of fish produced is nearly constant so that quantities of phosphorus released

depend principally on the food phosphorus content and on the FCR (Food Conversion Ratio : kg food fed per kg fish produced).

Food phosphorus content has tended to decline from 2 % traditionally to nearer 1 % in modern trout diets. FCR's are also being reduced.

The report estimates that, at present and on average, around 12,5 kg of phosphorus are released into the aquatic environment per tonne of trout produced. This is comparable to an urban population of 680 persons (before sewage treatment).

The chemicals required for P-removal from urban sewage cost £5/(kg P removed) in the Lough Neagh catchment area (average cost, 1987). The phosphorus released by a trout farm can thus be considered to have an equivalent cost of £62.50/(tonne of fish produced), to which sewage treatment works capital installation costs and sludge treatment costs should be added.

The report also examines the forms in which phosphorus is released. Results from two rainbow trout farms suggest that lower P-content diets result in lower proportions of soluble reactive P (readily available for uptake by algae) and higher proportions of particulate phosphorus.

*"Phosphorus from fish farms" RH Foy, Aquatic Sciences Research Division, Department of Agriculture (Northern Ireland), Published in "Trout News" (1992) UK Ministry of Agriculture, Fisheries and Food, Lowestoft, Suffolk NR33 0HT, UK.  
Report available from SCOPE*

## FRANCE

### NTA, EDTA and phosphate removal

#### CHELATING AGENTS REDUCE THE EFFICIENCY OF SEWAGE TREATMENT

Dr. Falaki and Dr. Martin of the Ecole Nationale Supérieure de Chimie at Rennes have studied the impact of NTA and EDTA on sewage phosphate removal using activated sludge. Their studies used laboratory models of sewage treatment systems (anaerobic followed by aerobic treatment).

Concentrations relative to the biomass of 40 mg/g MVS NTA or 45 mg/g MVS EDTA caused dysfunctioning of biological phosphate removal.

At significantly lower concentrations (10 mg/g MVS), P-removal efficiency was lost after around 10 days of feeding with NTA or EDTA containing influents.

This effect is thought to be caused by the retention of oligo-elements by the chelating agents, leading to a reduced biological capacity to eliminate phosphorus (NTA and EDTA), ammonia (NTA) or nitrates (EDTA).

NTA appeared to be biodegrading anaerobically as from introduction but aerobically only after 19 days. No biodegradation of EDTA was demonstrated.

*Source : note on study submitted to SCOPE Newsletter.*

*Full details : Dr. G. Martin, ENS Chimie, avenue Général Leclerc, 35700 Rennes, France*

## UNITED KINGDOM

### "Trouble with Algae"

#### EDUCATIONAL BOOKLET ON NUTRIENTS AND EUTROPHICATION SENT OUT TO ALL UK SECONDARY SCHOOLS

An educational booklet on nutrients and algae has been published in the Hobsons Scientific "Issues" series in cooperation with the UK Freshwater Biological Association and Albright & Wilson (detergent manufacturers).

Designed for the 'A'-level General Studies course (17-18 year olds), the booklet was launched at a British Association for the Advancement of Science meeting in August 1992 and has been sent out to all UK secondary schools.

The booklet examines exactly what algae are and what eutrophication is, the historical development of eutrophication problems and nutrient cycles in the environment. Through two case studies (fresh water : Norfolk Broads and marine environment : North Sea), the booklet looks at the sources of nutrients and possible methods for controlling algal problems.

A set of teacher's notes has also been produced, including exercises and further background information. The feasibility of producing other language versions of the booklet (as already for other Hobsons "Issues" booklets) is currently being examined.

*Sample copies of the booklet "Trouble with Algae" are available on request from SCOPE.*

# SCOPE NEWSLETTER

IN EUROPE

## HOLLAND

### Recovery of phosphate from sewage

#### "SIDE STREAM" PELLET REACTOR INSTALLATION FOR 160 000 POPULATION EQUIVALENTS COMMISSIONED FOR MID-1993

The "Side stream" tertiary sewage treatment process is able to meet stringent requirements for phosphorus removal to comply with the EC Directives. The process involves a combination of biological phosphate removal and recovery of the removed phosphate as pellets ready for industrial use without contamination of the environment.

The process has been developed by the Dutch company DHV Water and has been researched thoroughly over a number of years with government and industrial support. The tradename of the recovery-step is Crystalactor (Registered Trade Mark).

Since 1988 a Crystalactor for P-removal has been in operation in the Netherlands with a connected load of 12 000 p.e. (= person equivalents).

Pellet reactor technology involves the following steps :

- . the phosphate containing process stream is introduced into the reactor,
- . lime solution is added to the reactor for pH-conditioning and calcium phosphate is crystallised on sand carrier particles in the reactor,

- . the grown particles are removed from the reactor and replaced by fresh sand,
- . the grown particles contain 40-50 % calcium-phosphate and can be blended with imported mineral phosphate rock to be reused by the phosphate industry.

The advantages are :

- . an efficient process with effluent low in P, irrespective of the incoming P-concentration,
- . no excess sludge formation, thus reducing running costs,
- . the phosphate is reclaimed not as waste, but in a commercially valuable form,
- . compact installations,
- . easy to operate,
- . suitable for retrofitting to existing treatment plants.

The combination of pellet reactor technology with biological P-removal combines the advantages of both processes, ensuring a high P/low volume input to the Crystalactor, thus improving its economic performance whilst optimising quantities of phosphate reclaimed for resale.

The first major "Side stream combined Crystalactor" installation for P-removal is due to be commissioned at the Geestmerambacht sewage treatment plant (160 000 p.e.) of the US Water Board (Holland) by mid-1993.

*Further information : Jan van der Molen or Erik Eggers, DHV Water BV, P.O. Box 484, 3800 AL AMERSFOORT, Holland. Tel. (31) 33-682200.*

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# SCOPE NEWSLETTER

IN EUROPE

Number Five - July 1992

## UNITED KINGDOM

**ROYAL COMMISSION ON ENVIRONMENTAL POLLUTION REPORT ON FRESHWATER QUALITY**  
Disappointment at deteriorating water quality in the UK. Assessment of surface and groundwater.. quality, covering a wide range of pollution sources and recommendations for monitoring and for improving water quality.

Discussion of eutrophication problems and possible measures, including sewage..... treatment and reducing detergent ..... phosphates ..... p. 2

## UNITED NATIONS

**UN ECONOMIC COMMISSION DETERGENT PHOSPHATE STUDY**  
A comprehensive study on the use and environmental implications of detergent phosphates and of substitute products published by the UN Economic Commission for Europe.  
Full analysis of the current situation and of new developments. Impact of phosphates and of substitutes on sewage treatment and on the environment ..... p. 3

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**ECOTOXICITY OF CLEANING PRODUCTS**  
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## SWEDEN

**HELSINGBORG INTRODUCES PHOSPHATE-STRIPPING**  
Authorities' leaflet advises consumers on detergent choice ..... p. 4

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**PHOSPHATE CONTROLS COULD COST FISHERIES DEARLY**  
Dutch report on eutrophication and marine fish stocks links falling fisheries takings to lower North Sea phosphate inputs ..... p. 4

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**ORIGINS OF SURFACE WATER PHOSPHATE CONTENT**  
Estimation of reduction in surface water phosphate loads resulting from the use of P-free detergents in Germany ..... p. 5

## GERMANY

**SCIENTISTS AGAINST RETURN TO DETERGENT PHOSPHATES**  
Two articles published in GWF Wasser-Abwasser cover positions criticising a possible return to the use of detergent phosphates ..... p. 6

### The SCOPE Newsletter :

- . aims to provide a platform for objective and scientific information on the effects of phosphate-containing and phosphate-free detergents on the environment
- . includes summaries of scientific, technical and administrative information and a review of press articles.

### SCOPE (Scientific Committee on Phosphates in Europe) :

- . a non commercial, non profit-making association (Association Sans But Lucratif) based in Brussels
- . the association includes international groups headquartered in Belgium, France, Spain, Sweden and the UK, producers of a wide variety of detergent ingredients including phosphates.

### Contributions :

- . are invited on all subjects concerning phosphates, detergents, sewage treatment and the environment : scientific papers for résumé, comments on the studies mentioned in this Newsletter, other scientific or technical news.

### Further information :

- . addresses of scientists or organisations are given where possible
- . copies of articles and papers summarised in the press review can be obtained on request from SCOPE
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**United Kingdom  
Royal Commission**

**REPORT ON "FRESHWATER QUALITY"  
RECOMMENDS OBJECTIVES AND ACTIONS  
ON EUTROPHICATION**

The UK Royal Commission on Environmental Pollution is an independent standing body, established in 1970 "to advise on matters, both national and international, concerning the pollution of the environment ; on the adequacy of research in this field ; and the future possibilities of danger to the environment".

The Commission's 16th report, published in June 1992 under the chairmanship of Lord Lewis of Newnham and entitled "Freshwater Pollution", concerns pollution of rivers, lakes and groundwater. Estuaries and coastal waters are excluded (covered in the Commissions reports n° 3, 1972 and n° 10, 1984), as is drinking water.

The report looks at surface and groundwater use, quality monitoring, eutrophication and acidification, and at a wide range of pollution sources : industrial and domestic waste water and sewage treatment, contaminated lands (including landfill sites), transport, farming (in particular nitrates and pesticides), waterborne pathogens. Possible economic instruments are discussed and comprehensive recommendations are made regarding water quality objectives and management.

The report emphasises that there are elevated levels of phosphates in rivers, lakes and reservoirs in most of central, eastern and southern England and that this contributes to eutrophication.

The report's recommendations underline the need to set up a comprehensive, nationwide system of monitoring of surface water quality, including assessments of eutrophication levels based on :

- . biological species diversity assessment,
- . nutrient level analysis,
- . definition of quality objectives based on "natural" nutrient levels.

To achieve these objectives : "widespread removal of phosphate from sewage works' effluents may be needed. Substitutes for phosphate in detergent should not, however, be adopted on a widespread basis until their environmental impact has been fully assessed".

The report recommends that the Government investigate steps to facilitate reductions in detergent consumption in areas with soft water where less phosphate builder would be required to neutralise mineral ions present in the wash water and in textile soils.

The report points out that the use of zeolite, the detergent builder most widely used as a partial substitute for phosphates, implies an increase in sewage sludge volumes and a reduction in its calorific value. The report notes that zeolites act more slowly than phosphates in binding calcium ions and are less active for magnesium ions, thus necessitating the use of co-builders, typically polycarboxylates (PCA) whose "effects on health and the environment have still be investigated fully".

*Royal Commission on Environmental Pollution  
Report n° 16 "Freshwater Quality" (Ref. Cm 1966,  
ISBN 0-10-119662-8, June 1992).  
Her Majesty's Stationary Office (HMSO)  
PO Box 276, London SW8 5DT, England,  
Tel : (44) 71 873 00 11*

# SCOPE NEWSLETTER

IN EUROPE

**United Nations  
Economic Commission for Europe**

## **ANALYSIS OF IMPLICATIONS OF DETERGENT PHOSPHATE SUBSTITUTES**

The UN Economic Commission for Europe Working Party on the Chemical Industry has published a study analysing the current situation and new developments in the use of substitutes for detergent phosphates.

The report examines the different sources of phosphates in the environment, concluding that on average in Europe today "the contribution of detergents to the total environmental load of phosphate is less than 15 %". In countries where detergent phosphate is not restricted, such as the UK, this figure is 20 - 25 %.

After noting that the reduction or elimination of phosphates from detergents would appear to be an attractive solution for controlling eutrophication (costs are borne by detergent manufacturers and consumers, not by authorities), the report states there is no convincing evidence that removal of phosphates from detergents can result in a change in the eutrophic state of a body of water.

Regarding the different chemicals used in P-free detergents, the report examines the availability, performance, environmental and sewage treatment implications of :

- . builders : Zeolite A, citrates, NTA, soap
- . co-builders : soda ash, sodium silicates, polycarboxylates
- . others : phosphonates, EDTA

The report concludes that "no single substitute is able to replace STPP and maintain product performance without reformulation of the product composition, possibly involving the use of co-builders or other materials. Final conclusions concerning environmental impact of a choice between phosphates and substitutes are considered impossible without considerable further research".

For Zeolite A, the builder most widely used as a partial replacement for phosphates, the product has been shown to have very low toxicity or bioaccumulation. Laboratory and field experiments show that trace metal concentrations in sewage plant effluents were not significantly influenced by the presence of Zeolite A but batch experiments showed considerable mobilisation of heavy metals.

Zeolite A appears to improve certain aspects of sewage plant performance, in particular sludge retention and therefore nitrate removal. However, the use of Zeolite A in detergents increases sludge volumes, eg. by 10-15 %.

*United Nations / Economic Commission for Europe*  
*"Substitutes for Tripolyphosphate in Detergents" -*  
*Sales number E.91.II.33. - New York 1992*  
*United Nations Publications -*  
*CH - 1211 GENEVA 10*

**Switzerland**  
**Cleaning products environment test**

**ECOTOXICITY STUDY OF 38 CLEANING PRODUCTS**

A study carried out at the Federal Polytechnic Institute of Lausanne looks at the ecotoxicity of 38 domestic cleaning products (textile detergents, dishwasher detergents, other cleaners). In aquatic acute toxicity studies on daphnia, it was shown that toxicity is principally related to surfactant concentrations.

Toxicity was also tested for soil microflora and for earthworms. Earthworms proved to bioaccumulate significant concentrations of LAS surfactants (linear alkylbenzene sulfonates, the most widely used synthetic anionic surfactants) although this did not seem to affect the earthworms' activity.

*Etude Toxicologique de Détergents Domestiques - Ecole Polytechnique Fédérale de Lausanne - Ecotoxicity Research Group (Prof. Tarradellas). Study carried out by research students : B. Horisberger and Dr. A. Susini - February 1991*

**Sweden**  
**Sewage treatment**

**NEW HELSINGBORG SEWAGE WORKS REMOVE PHOSPHATES**

The Helsingborg water authorities have distributed a leaflet presenting the city's new sewage works to 40,000 households.

The leaflet explains that the new installations remove phosphates from waste water and that consumers "should choose washing detergents containing phosphates in preference to any substitutes". The leaflet points out that the city's water is soft and so consumers should use the lowest recommended detergent dosage.

Copies of the leaflet and English translation are available from E.C.U.

*Helsingborg Gatukontor  
Gasebäcksvägen 4  
25227 HELSINGBORG*

**Holland**  
**eutrophication and marine fish stocks**

**CONTROL OF PHOSPHATE INPUTS COULD COST NORTH SEA FISHERIES 1 BILLION DOLLARS**

Landings from North Sea fisheries were extremely stable from 1900 through to around 1950. Sustainable production was estimated at 400,000 tonnes. Takings rose to around 1,000,000 tonnes in the 1980's without significantly reducing stocks.

A report from the Netherlands Institute for Fisheries Research, analysing these changes, concludes that, on the basis of available evidence, the productivity of the North Sea has increased since 1950 due to the discharge of nitrogen and phosphorus compounds from human activities.

# SCOPE NEWSLETTER

IN EUROPE

Increased productivity also results from the creation of man-made gulleys which take the water from the Rhine and Meuse rivers further out into the sea, thus widening the mixing zones for nutrient rich waters.

A 50 % reduction in inputs of nutrients into sensitive areas of the North Sea has been agreed by this second international conference on the protection of the North Sea, London, November 1987. Phosphate discharges in the Rhine, for example, have already been reduced to the 1960 level.

Negative effects on stocks of shrimps, bivalves and fish can already be indicated and further reductions in fisheries production are expected as reduced nutrient levels lead to a decrease in food abundance for fished species.

*Eutrophication of the North Sea continental zone : a blessing in disguise.*

*R. Bodiker and P. Hagle  
Netherlands Institute for Fisheries Research  
PO Box 68  
1970 AB IJmuiden - Netherlands.*

## Germany Detergent phosphates

### ORIGINS OF SURFACE WATER PHOSPHATE CONTENT

A paper by Dr. A. HAMM, Chairman of the Main Committee of the German Scientists' Water Chemistry Group examines the effect on watercourses if detergent phosphates were to reappear in what was West Germany.

Phosphorus reaching watercourses has been reduced from 103,500 tonnes in 1975 (41 % from detergents) to 62,800 tonnes in 1989 (9.9 % from detergents) as a result of the introduction, partly by legislation and partly by consumer choice, of P-free detergents. This figure is expected to fall to 35,900 tonnes (8.1 % from detergents) with continuing use of P-free detergents.

Given measures already planned concerning sewage treatment (phosphate removal for > 20,000 inhabitants), the reintroduction of P-based detergents would cause this figure to rise to 41,600 tonnes (22 % from detergents).

If phosphate stripping was introduced at all sewage plants, figures of 30,800 (P-free detergents) and 32,300 (P-based detergents) could be achieved.

Because sewage treatment in what was East Germany is inadequate, the use of P-based detergents here would lead to considerably higher phosphorus loads in watercourses.

No conclusions are drawn concerning the environmental impact of these higher phosphorus loads.

*Dr. A. HAMM "P-free or P-based detergents : consequences for phosphorus concentrations in surface waters",  
Tenside-Surfactant-Detergent 28 (1991) 6, Carl Hanser Verlag, Munich.*

**Germany**  
**Disagreement on substitutes**

*"Contribution to the Discussion concerning Phosphates in Washing Agents" GWF Wasser-Abwasser 9/1991, R. Oldenburg Verlag, Munich*

**GERMAN CHEMISTS' MAIN COMMITTEE  
REPLIES TO PAPER ON PHOSPHATE  
SUBSTITUTES**

The Main Committee of the German Scientists Water Chemistry Group has published a reply to G. LEYMANN's article "The problems of substitutes with reference to phosphate-free detergents" (see SCOPE Newsletter n° 4, December 1991).

The Phosphate and Waters Main Committee has, since the phosphorus study of 1975, carried out several extensive studies and commented on the environmental significance of phosphates and phosphate substitutes in detergents. The results and assessments with regard to zeolite A, polycarboxylates, phosphonates and complexing agents, especially NTA, are presented, and statements on them in the Leymann article are commented on.

The forecasts of phosphate inputs to surface waters (old states of the Federal Republic of Germany) are also presented with the following variants :

- elimination of phosphates at municipal sewage treatment plants serving > 20,000 inhabitants,
- elimination of phosphates in all sewage treatment plants,

both cases with the assumption of phosphate-free detergents and phosphate-containing detergents (according to Phosphathöchstmengeverordnung).

**Germany**  
**Dealing with eutrophication**

**PHOSPHATES IN DETERGENTS ARE A  
MISTAKE**

In a paper by Martin Böhme in GWF Wasser-Abwasser, two possible ways to fight against eutrophication are balanced one against the other : waste water purification with perfect P-elimination against minimising use of phosphates at the source.

Two important results have to be mentioned in this context : In case of a contact-filtration aiming to reach the required low discharge concentrations, similar polycarboxylates are used as in P-free detergents. However, their ecotoxicological effects are probably more negative since only a few data exist on such chemical residues according to the chemical law (Chem. G).

Moreover, the number or all the "loopholes" through which phosphates could unintentionally be discharged from waste water into a water body show that it is too late to retain the phosphates at the sewage plant. It is absolutely necessary to call for minimising P-content, independent of the purification capacity of a sewage plant.

# SCOPE NEWSLETTER

IN EUROPE

Due to the lack of sewage systems and storm water overflows, the amount of phosphate being discharged into the water bodies is so high that it is impossible to prevent eutrophication.

This is particularly true for the former GDR which is

expected to halve the P-content in its water bodies after introducing P-free detergents.

*M. Böhme, "The Problem of Substitutes - Phosphates in washing agents are still the wrong way"  
GWf Wasser-Abwasser 7/1991, R. Oldenburg Verlag, Munich.*

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Special number "compact detergents, washing performance and environmental impact"  
March 1992

# SCOPE NEWSLETTER

IN EUROPE

Number Four - December 1991

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## EDITORIAL

The SCOPE Newsletter is produced by the SCIENTIFIC COMMITTEE ON PHOSPHATES IN EUROPE, a non commercial, non profit-making association (Association Sans But Lucratif) based in Brussels.

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For each study or paper mentioned in the SCOPE Newsletter, the full document can be obtained directly from :

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**UK**  
**National Rivers Authority**

### **ALGAE UNDER CONTROL**

The UK National River Authority (NRA) has launched a £ 600 000 programme to develop action plans for dealing with the problem of potentially toxic blue green algae.

The programme aims to develop a model to determine factors responsible for blue green algae growth and a field kit to test for toxicity. The programme will also look at how and why toxins are produced, what happens to them in the environment and in the food chain. A library of toxins in British fresh water will also be established.

The NRA considers that there is now a much greater public understanding of the problem and of the precautions should be taken to avoid contact with the algae. An expanded version of the NRA's existing public information leaflet on the subject is being produced.

Elsewhere, the NRA is using bales of straw to prevent the development of blue green algae formation in Silksworth Lake, Sunderland. Around 40 bales of straw were used to build an organic filter across the lake. Recent research has demonstrated that straw has an inhibiting effect upon algae growth, probably by slowly releasing a natural growth inhibitor.

(see SCOPE Newsletter n° 2)

*National Rivers Authority - Kingfisher House -  
Goldhay Way - Orton Goldhay -  
Peterborough - England*

**Switzerland**  
**CIPEL**

### **LAKE GENEVA EUTROPHICATION SITUATION IMPROVING**

The CIPEL (Commission Internationale pour la Protection des Eaux du Léman) considers that the health of Lake Geneva has been significantly improved over the last 12 years as a result of a variety of measures including sewage treatment, phosphate stripping in many sewage works, reductions in industrial pollution and a detergent phosphate ban introduced in Switzerland in 1986.

Summer algal growth has been reduced but water oxygen concentrations have not improved because of insufficient mixing of the lake's water (mild winters).

The CIPEL considers that further efforts are necessary in order to restore the lake to good health. The plan put forward includes the introduction of phosphate stripping at all sewage stations around the lake and improved management of agricultural manure and fertilisers. A Swiss call for a detergent phosphate ban on the French side of the lake has been ignored.

*Further information  
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CH 1000 Lausanne 12  
Switzerland*

**Germany  
Wasser Abwasser**

**AUTHORITIES QUESTION "UNCALCULABLE RISKS" OR PHOSPHATE SUBSTITUTES**

Gunter Leymann of the Mecklenburg-Vorpommern Environment Ministry, has published an important paper analysing the advantages and disadvantages for the environment of the use of P-free detergents.

"Phosphates have a considerable influence on the eutrophication of waters. Therefore the reduction of the phosphate load is one of the most important objectives of water protection policy. This paper gives a comparison of the technical and ecological properties of the phosphates used in detergents and the most important phosphate substitutes. The results of this comparison is a clear decision for the utilisation of phosphate in detergents because the substitutes have some ecological disadvantages and must be evaluated as an ecological risk. Considering the cheap and available precipitation techniques for phosphates in sewage works, it is unnecessary and therefore unintelligent to enter these risks."

Mr. Leymann quotes the Society of German Chemists' specialist group on water chemistry in considering that phosphorus precipitation in sewage works is simpler, cheaper and ecologically more effective than a ban on detergent phosphates.

The paper compares the technical and ecological properties of detergent phosphates with those of the principal substitute chemicals used in Germany (zeolite, sodium carbonate, NTA, PCAs ...), looking in particular at toxicity, consequences in sewage sludge, stimulation of algal growth.

*Dipl.-Ing. Gunter Leymann in Wasser-Abwasser (Gas und Wasserfach) 1991 n° 7. Full English translation of paper available from Scope.*

**Germany  
North Sea**

**GIANT BLOOM OF SILICA DIATOM ALGAE**

A scientific expedition, financed by the German Ministry for Research, discovered a "gigantic algal bloom" in the North Sea in the late summer of 1991. The algae are principally silica-based diatoms of the species *Coscinodiscus waiesii*.

The bloom represents a potential danger for fish, shellfish and other sea life by absorbing oxygen from the water as the alga die and decompose.

Scientists on the expedition from the Botany Institute of the Hannover University stated that they consider the bloom was a consequence of the use of P-free detergents : the substitutes used instead of phosphates contain silica.

This idea was refuted by the Federal Environment Ministry and the German Detergent Industry Association who consider that most of the silica contained in P-free detergents is retained in sewage treatment (90% of zeolite is trapped in sewage sludge) and does not therefore reach the sea.

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2000 Hamburg 25  
Germany*

**Italy  
Eutrophication**

**DETERGENT PHOSPHATES NOT GUILTY  
IN ITALY**

Italy introduced, on March 3rd 1988, legislation limiting detergent phosphate content to 4%.

This legislation has resulted in the average detergent phosphate content dropping from 11% to under 4%. The law also required the Italian Ministries for Health and for the Environment to produce annual reports assessing eutrophication problems in Italy.

The official report published this Autumn, based on 1988 data, estimates that the detergent phosphate legislation has reduced the quantities of phosphorus reaching Italian waters from 59 000 to 49 000 tons, but no improvement in water quality of seas or lakes has been demonstrated, except in areas where sewage treatment plants have been installed.

The remaining phosphorus input comes from agriculture, animals and industrial and urban waste waters. The report suggests that the only way of reducing eutrophication problems is an integrated series of legal administrative and technical actions aimed at all phosphorus generating sources.

The report also states that phosphorus levels are not considered to be related to the mucilage scum problems which have occurred in the Adriatic, particularly in 1989.

*English translation of excerpts of report available from SCOPE*

**Scandinavia  
Green Label**

**PROJECT FOR WHITE SWAN EXCLUDES  
PHOSPHATES**

The ninth version of a proposed text defining criteria for eligibility for detergents for the White Swan Label has been circulated to industry and associations for consultation. The White Swan project is for a Nordic Green Label which will be applicable in Sweden, Norway, Iceland, Finland (Denmark being covered by current EC Green Label projects).

The ninth text suggests that "Complexing agents, such as EDTA, phosphates, NTA and phosphonic acid/phosphonates, etc. must not be included as active components for the softener/builder function". The text also excludes the use of perborate bleaches, optical whitening agents and dyes.

# SCOPE NEWSLETTER

IN EUROPE

This suggestion has caused immediate opposition from various sources including the detergent industry and scientists working in public authorities. Urban Jonsson of the Stockholm Water Authority appeared on Sweden's TV4 News stating that : "We shouldn't substitute phosphates before we have a better knowledge of what we get instead". In 1990, the Stockholm Water Authority ran an information campaign encouraging consumers to use P-based detergents, in which they stated : "Modern sewage systems are very efficient at removing detergent phosphates. They are not efficient at treating the substitute products used in P-free detergents. These substitutes reduce the efficiency of domestic sewage treatment and can prove dangerous".

*A full English translation of the Nordic White Swan project text on detergents is available from SCOPE.*

## Holland Rhine

### REDUCED NUTRIENT LEVELS IN RHINE

Phosphorus and nitrogen levels input by the Rhine river into the North Sea have fallen significantly as a result of environmental protection measures in the different countries along the river. From a peak of 1.2 kg/second, they have now fallen to around 0.2 kg/second.

According to D. Boddeke from the Dutch Institute for Fisheries Research, this drop in nutrient levels is causing a significant reduction in mussel and shrimp crops. This may be the cause of a current massive drop in Eider duck populations : their numbers had increased from a few thousand in the 1960s to 150 000 in the 1980s.

It is feared that fish catches will also fall. Catches were stable in the 1930s - 1950s at around 400 000 tons and have increased to over a million tons at the end of the 1980s.

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*RIVO - Dutch Institute for Fisheries Research  
Po Box 68 - 1970 Ab Ymuiden - Holland*

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# SCOPE NEWSLETTER

IN EUROPE

Number Three - October 1991

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## EDITORIAL

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## OFFICIAL NEWS AND REPORTS

### *Britain rejects P-ban*

**UK Government announces that detergent phosphates will be monitored but not banned**

After submitting the conclusions of the Consultants in Environmental Strategy report on detergents and pollution to 37 organisations. 14 organisations returned detailed replies to this consultation : "there was no consensus on the question of whether further substitution of phosphorus by other substances would have a net beneficial environmental effect".

Following this consultation, the UK Government has officially announced that the use of phosphate in detergents and their environmental effects should be

closely monitored but there should be no ban on phosphate use. Mr Trippier, Secretary of State for the Environment, made this statement in a written reply to the House of Commons on the 24th of July 1991.

He also stated that existing voluntary agreements with industry, which prevent the use of EDTA and NTA as builders in domestic detergents, should be continued.

The terms of reference and membership of the Technical Committee on Detergents and the Environment have been modified to enable it to pursue research and investigation into the effects of detergents on the environment.

*Full copy of the parliamentary written answer available from Scope.*

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## Phosphates OK for Denmark

### Danish Government report on Green Labelling of detergents

A report prepared by Professors Jesper Toft and Ole Dall for the Danish Ministry for Environmental Protection develops possible models for a national Green Labelling scheme in Denmark. To illustrate the applicability of the system proposed, four product families are examined :

- ◆ washing machines
- ◆ textile detergents
- ◆ data printing paper
- ◆ kitchen paper

For textile detergents, the report looks at products adapted for "environmental wash programmes" (maximum 60°C; no pre-wash; slightly soiled, coloured textiles). The report looks at the different ingredients which can be included in such detergents and their implications on the environment, from detergent manufacture through to detergent use and water treatment.

Amongst other points, the report examines the impact of phosphate-containing and phosphate-free detergents. The report notes that P-free detergents are generally built with zeolite but necessarily also contain other compounds, such as polycarboxylates (PCAs), as well as generally higher concentrations of surfactants. The report quotes the Danish Board of Environment (1989) in stating that the environmental impact of these compounds has not been sufficiently investigated.

One of the aspects that a labelling scheme must look at is the balance between the environmental impact of phosphates and the difficulties caused by replacement chemicals. Given the quality of sewage treatment in Denmark, the report suggests that 100% P-free detergents are not necessarily the best solution in terms of reduced environmental impact. A maximum level of 15 % P<sub>2</sub>O<sub>5</sub> (equivalent to roughly 26 % phosphates) in detergent is suggested, considered as adequate for calcium binding in semi-hard water.

The report work was managed by a steering group made up of representatives of authorities and associations.

*Danish Ministry for Environmental Protection Report n° 154: Investigation of technical bases for positive environmental labelling of products, 1990. An English translation of key chapters of this report (including the chapter on detergents) is available from Scope.*

## Blue Angel for detergents

### Component system detergents eligible for German environment label

The Jury of the German Federal Ministry for the Environment's environmental labelling scheme has, for the first time ever for detergents, indicated that the "Blue Angel" label could be attributed to component systems.

Such systems allow the user to add different quantities of the various active ingredients of the detergent, as a function of the wash required (colour of fabric, hardness of water ...). Detergent, water softener and bleach agent are packaged and sold separately.

The Federal Environment Office estimates that complete replacement of conventional detergents by component systems could reduce by 20 % (100 000 tonnes/year) the volume of detergent products used.

In Switzerland, the Stiftung für Konsumentenschutz (Foundation for Consumer Protection) recently tested seven component systems (Test Magazine n° 180, April 1991). The products are all assessed as generally "good" or "very good" in terms of washing performance. In terms of environmental impact, one only is assessed as "good", five as "adequate" and one as "poor".

The organisation concludes its analyses by recommending that consumers change to component systems and use as low dosages as possible.

## TECHNICAL STUDIES

### Focusing on dirt

#### New methods for visualising detergent washing performance

Recent research carried out by the company Allbright & Wilson in the UK and presented in the magazine "New Scientist" (May 4th, 1991) shows that for a "green" P-free washing powder, accumulation of deposits on washed fabrics is much higher than with a top-quality phosphate-based detergent.

The tests carried out by the company compared phosphate-based washing powders with "green" powders : formulations containing zeolite A but without other performance-enhancing ingredients (in particular, polycarboxylates) included in many commercial P-free formulations.

The results were obtained by repeated washing of fabrics followed by incineration. The weight of ash remaining after incineration indicates the accumulation of incrustations on the fabric.

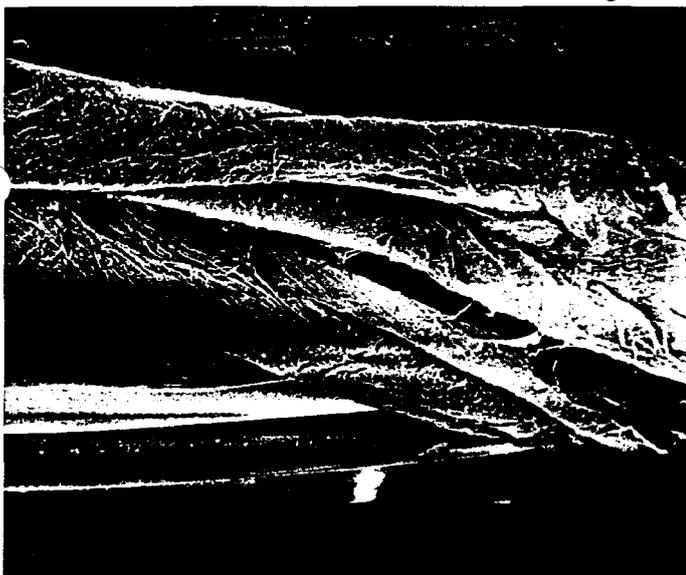
The "New Scientist" article notes that accumulation of incrustations on fabrics has been shown to increase the adherence of bacterial spores and that this can have possible consequences on hygiene.

# SCOPE NEWSLETTER

IN EUROPE

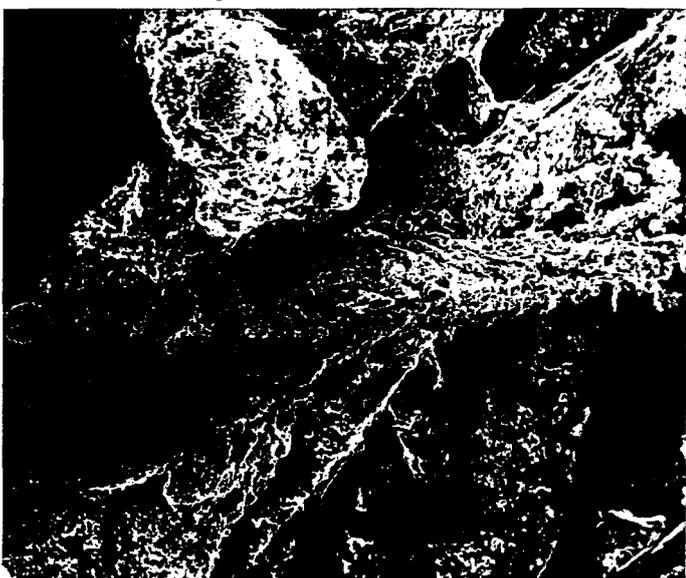
These results have been vividly illustrated by electron micrographs of fabrics washed using different detergents. These micrographs have been produced by Lancaster University UK. Two examples are shown below :

◆ the sample (A) was washed 15 times at 40° C in hard, clean water using a phosphate-based market-leader detergent at 40 % of recommended dosage. (This underdosing reduces the number of washes necessary to obtain clear results). The result corresponds to a residual ash content after incineration of 0.3 % of fabric weight.



(A) : Electron micrograph of fibres washed with phosphate-based detergent

◆ the sample (B) was washed under identical conditions using a "green" brand of detergent, zeolite-built but without the addition of other chemicals necessary to compensate for the removal of phosphates. The result corresponds to a residual ash content after incineration of 3.5% of fabric weight.



(B) : Fibres washed with a "green" brand detergent.

Further studies are currently underway to measure and illustrate the performance of different detergents.

## *Some detergents are cleaner than others*

### **International studies on detergent performance and environmental impact**

#### Performance study shows advantages of P-containing compacts

A report published by the CTTN/IREN (Centre Technique de Teinture et Nettoyage/Institut de Recherche sur l'Entretien et le Nettoyage) compares washing performance of standard and compact detergents with and without phosphates. Eight different detergents were tested for washing performance at 60° C looking at washing of dirtied fabrics (whitening), stain removal and mineral incrustations.

The study concludes that for dosages used in the home, the phosphate based compact detergent offers considerably better washing performance than the others tested. The compact detergents without phosphates used at recommended dosages offer washing performance considerably inferior to standard detergent types dosages, currently used in the household.

*Report n° 18, 8th January 1991  
CTTN/IREN, BP 41, 69131 Ecully, France*

#### Relations between performance and environmental impact

Further results from a second study carried out by the CTTN/IREN (see above) in the first semester of 1991 confirm the conclusions of their previous study concerning washing performance of P-based and P-free standard and compact detergents.

11 commercially available detergents were tested for soil removal at different dosage concentrations. The results show that in every case :

- ◆ P-based compacts perform better than any other category of detergent
- ◆ their washing efficiency at 5g/l is better than that of other detergents at 10g/l (including P-free compacts)

In order to relate performance to environmental impact, the Total Organic Carbon (TOC) content of each of the 11 detergents tested was assessed by the Pasteur Institute Lyon. The TOC contained in the doses of detergents

actually necessary for equal washing performance were then compared:

	Average - Total Organic Carbon per wash - (grammes)
Standard powders	
◆ P-based	8.60
◆ P-free	9.58
Compact powders	
◆ P-based	6.49
◆ P-free	15.08

Taking into washing performance, the use of P-based compacts represents a significantly lower load on the environment, whereas the use of P-free compacts leads to a large increase in Total Organic Carbon content.

*Full report available in detail from SCOPE.*

#### Spanish study looks at environmental implications of P-free formulations

A study carried out by CSIC (Institute for Chemical and Textile Technology), Barcelona and published in the Spanish magazine AGUA (Water) compares samples of four different types of detergent formulation purchased in Spanish shops in 1990 :

- ◆ phosphate-built powder
- ◆ phosphate-free powder
- ◆ phosphate-built liquid
- ◆ phosphate-free liquid

The results obtained are as follows :

- ◆ suspended matter : much higher levels in solid formulations with the P-free solid having significantly higher levels than the P-based solid
- ◆ organic carbon content and chemical oxygen demand : significantly higher for the P-free liquid
- ◆ biodegradability : very low for the P-free solid
- ◆ ecotoxicity : higher for the liquid formulations, in particular the P-free liquid

AGUA

Ano XI Num 77 JANuary 1991

Article by J. Sanchez Leal, JJ Gonzalez, MT Cigauda, F Comelles

Instituto de Tecnologia Quimica y Textil  
CSIC, Barcelona

## EUTROPHICATION PROBLEMS

*Italian weather too good*

#### **Mucilage in the Adriatic caused by climatic conditions**

A mathematical model elaborated by Mr Thomas TOMASINO (Researcher at the Hydrologic Service of the

Centre for Hydrologic and Structural Research of the ENEL), and based on research by the German biologist Smetaceck, suggests that mucilage in the Adriatic is principally a result of good weather.

According to the model, the lack of wind along with warm temperatures and the lack of rain (reducing volumes of waters in the rivers) do not allow the waters in the Adriatic to mix sufficiently. It is this stagnation which is related to the formation of mucilage.

The mucilage is not due to an excessive of nutrient load in the sea but rather to a lack of nutrients resulting from reduced water volumes carried by the rivers. The lack of nutrients places the algae under stress leading them to release mucopolysaccharides, ie. mucilage.

#### *Further information*

ENEL/CRIS Centro di Ricerca Idraulica et Strutturale  
Via Ornato 90/14  
20162 Milano  
Italy

#### *Algae grazers at risk*

#### **Dutch study shows how heavy metals are related to algal blooms**

Experimental field studies carried out in Holland have shown the validity of theoretical models which predict that the presence of heavy metals in fresh water can lead to algal blooms.

The studies carried out for the Government Institute for Wastewater Purification looked at the toxic effects of metal contamination in a fresh water plankton system in the field. Concentrations of eight metals (Hg, Cd, Pb, Zn, Cu, Cr, Ni, As) were used in 0.32, 1.1 and 3.2 x EC50 (16 days) levels during 42 day experiments and the systems were inoculated with *Daphnia magna*.

A part of the heavy metals introduced is absorbed onto solid particles in the field yet the overall toxicity *Daphnia magna* remains similar : the zooplankton in the field showing a higher sensitivity to nominal concentrations (around 2 x).

The studies conclude that heavy metal contamination of fresh water initially results in an inhibition of algal growth and biomass production. However, the toxicity towards zooplankton which graze on algae also causes a drastic reduction in their population and algal growth then occurs unchecked with blooms resulting.

It is interesting to note that the initial inhibition of algal growth results in a rise in water P and N concentrations which are maintained at the initial stage of the bloom. This demonstrates that related high P, N and phytoplankton concentrations do not necessarily prove a direct causal relationship, here both are caused by heavy metal toxicity.

TNO Report 89/314, author MCT Scholten,  
ordered by DBW/RIZA

Dutch Government Institute for Wastewater Purification

# SCOPE NEWSLETTER

IN EUROPE

## OTHER NEWS

### *Firemen choose phosphates*

#### **Phosphates used to fight forest fires in France**

A mixture of phosphates and clay is being used by fire-fighters in Southern France to prevent forest fires spreading. The product is used to coat plant foliage in areas around a fire by aerial spraying and serves to retard burning.

The active ingredient of the product is based on phosphates, the clay serving to thicken the mixture and

to increase its adhesion to plant foliage. An iron oxide is included to colour the product (coated foliage is a red-brown colour) enabling pilots to identify areas already treated.

The product is slightly corrosive but non toxic. The foliage treated is initially blackened by the concentrations of phosphates involved and the leaves fall. The vegetation rapidly recovers, however, the phosphates acting like a fertiliser. 3 600 tonnes of the product were used in France in 1990.

#### *Further information :*

*Antenne DFCl (Défense des Forêts Contre l'Incendie)  
Direction Départementale de l'Agriculture  
et des Forêts des Bouches du Rhône  
Valcros, Petite Route Milles,  
13090 Aix en Provence, France.*

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# SCOPE NEWSLETTER

IN EUROPE

Number Two : April 1991

## EDITORIAL

The Scope Newsletter is open to input from its readers across Europe and we welcome all comments or information.

These would be sent to SCOPE NEWSLETTER c/o E.C.U. (address below).

Contributions from readers are invited on all subjects concerning phosphates, detergents, sewage treatment and the environment.

You are invited to submit scientific papers for résumé, to send comments on the studies mentioned in the Newsletter or other scientific or technical news.

The Scope Newsletter is produced by the SCIENTIFIC COMMITTEE ON PHOSPHATES IN EUROPE, a non-

commercial association (Association Sans But Lucratif) based in Brussels. The association includes international groups headquartered in Belgium, France, Spain, Sweden and the UK, producers of a wide variety of detergent ingredients including phosphates.

For each study or paper mentioned in the Scope Newsletter, the full document can be obtained either directly from the scientist concerned (where the address is given) or from :

SCOPE c/o E.C.U.,  
81 rue François Mermet, 69160 TASSIN. France,  
Tel : (33) 78.34.23.39 Fax : (33) 78.34.83.49

## OFFICIAL REPORT

### Government commissioned study forms basis of UK national consultation on detergents and the environment.

The British Department of the Environment published in April 1991 the final report on "Pollutants in Cleansing Agents" prepared by the external consultants CES (Consultants in Environmental Sciences Limited). The objective of the study was to "identify the environmental hazards and other outcomes of the increased replacement of polyphosphates in detergent products."

The report examines the functions of the different components of cleaning agents and then analyses the chemistry, use, and potential effects on sewage treatment systems, on the environment and on health of phosphates (sodium tripolyphosphate - STPP), and of ten substances whose use is increased in P-free detergents : NTA, Zeolite A, polycarboxylic acids (PCAs), carboxymethyltartronate (CMT), carboxymethyloxysuccinate (CMOS), citrates, soap, carbonates, silicates and EDTA.

#### Zeolite A

Primary builder generally used to replace STPP in P-free detergents are not considered to pose problems for the environment.

The main problem directly associated with the use of

Zeolite A is an increase in sewage sludge (estimated at + 150,000 tonnes per year for Britain) and a reduction in sludge calorific value, increasing residues where sludge is incinerated.

However, the report points out that whenever Zeolite A replaces STPP in laundry detergent formulations, it must be co-built to maintain performance. Other substances are therefore included, in particular PCAs (often as 1-4 % of the detergent).

#### PCAs

The report concludes that "PCAs have proved to be largely non-degradable but are partially removed in wastewater treatment by absorption into sludge solids. Their widespread use in detergents gives cause for concern as limited data are available in terms of their fate in the water and soil environments."

"It is clear that more information is required on both the influence of PCAs on wastewater treatment and on the fate of PCAs in the natural environment before their widespread introduction in the UK."

#### EDNA, NTA

The report suggests that widespread use of these products should not be permitted in the UK, concluding that:

- EDTA is poorly degradable and has strong metal ion chelation properties,
- widespread use of NTA would lead to an increase in dissolved heavy metal species in the environment.

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Its aim is to provide a platform for objective and scientific information on the effects of phosphate-containing and phosphate-free detergents on the environment.

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## Sodium citrate

Not considered to pose environmental problems but widespread use would significantly increase BOD loads to sewage plants, leading to a risk of overloading, increased energy consumption and sludge production.

## Sodium carbonate, silicates

No particular problems are anticipated.

## Removal of phosphates

The CES report considers that removing phosphates from detergents in the UK would be "insufficient to control nutrient balances and the problems of eutrophication" and that local problems can only be resolved by phosphorus stripping at sewage plants.

**Note : The decision taken by EC Environment Ministers on the 18th of March this year, will make phosphorus-stripping obligatory in "sensitive areas" (lakes or coastal waters susceptible to eutrophication) throughout Europe, by the year 2000-2005.**

The report indicates that, where such studies have been undertaken (USA, South Africa, Germany, Australia, Canada), phosphate stripping at sewage works is a better economic solution (taking into account consumer costs) than reformulation of detergents. This balance would be even more striking in the UK where eutrophication is only a problem in some areas.

The report notes that the introduction of P-free detergents in Switzerland led to a significant increase in the consumption of detergents and also of decalcifiers and stain removers.

The CES report has been sent out by the UK Environment Ministry to environmental organisations and detergent manufacturers along with a consultation document requesting comments or reactions for a 31st May deadline.

*A copy of the report is available from the Department of the Environment, 43 Marsham Street, London SW1P 3EB, England, or from ECU.*

# SYMPOSIUM

## Detergents and Marine Environment

Three papers were presented at this specialist session of the IXth International Symposium on Medical Oceanography at the Carrefour Universitaire Méditerranéen in Nice (22 - 24th October 1990).

## Algal Growth Stimulation by Chelatisation : Risks Associated with Complexants in P-free Washing Agents

*U. Horstmann (Germany)*

The growth of algae in the aquatic environment depends primarily on the availability of the nutrients phosphorus (P) and nitrogen (N), but also requires a number of trace elements, one of which is iron, which phytoplankton require more than any other trace metal.

Dr. Horstmann describes various experiments which have demonstrated the importance of the presence of iron in dissolved complexes formed with organic and inorganic ligands. In certain conditions, algae secrete natural agents which catalyse the formation of such iron

complexes. Experiments show that complexants used in detergents (EDTA, NTA, polycarboxylates = PCA) can stimulate algal proliferation in seawater.

Dr. Horstmann also presents studies which have shown that NTA and polycarboxylates can mobilize from sediments or sequester heavy metals.

He concludes that since PCAs are not biodegradable, their use as a phosphate substitute in washing powders is inappropriate.

*Further information:*

*Institut für Meereskunde an der Universität Kiel, Düsternbrooker Weg 20, 2300 Kiel, Germany*

## The partitioning of polycarboxylic acids in activated sludge

*S. Yeoman, J.N. Lester, R. Perry (U.K.)*

Polycarboxylic acids (PCAs) are essentially used as a co-builder in detergents in order to enhance anti-redeposition and dispersant properties where reduced phosphate levels or no phosphates are used in the detergent.

Experiments used activated sludge from the Beckton sewage treatment works (Thames Water Authority) : laboratory-scale activated sludge simulations.

Results indicated that most of the carbon in the PCAs finished in the settleable solids while the majority of the remaining carbon was detected in the supernatant. Very little was totally mobilized and released as carbon dioxide.

The study concluded that removal of PCAs from waste waters was essentially by a process of binding to activated sludge settleable solids. This binding appeared related to but not totally dependent on metabolic activity. Only a low level of biodegradation was evident and this is likely to be co-metabolism related to or a consequence of constitutive extracellular enzyme action.

*Further information available from:*

*Civil Engineering Department, Imperial College, London SW7 2BU, UK*

## Conclusions

*Henri Augier, Laboratory of Fundamental and Applied Marine Biology, Centre for Study, Research and Information on the Sea, Marseille, France*

Recent new data is appearing on the following subjects:

- impact of spray laden with hydrocarbons and detergents on coastal deforestation,
- influence of detergents on the disappearance of certain algal populations, Poseidonian shore coverage and animal populations,
- problems of biodegradability of surfactants and toxicity of resulting degradation products
- mediocre performance of sewage treatment works in eliminating surfactants,
- influence of phosphates and of phosphate substitutes on eutrophication phenomena.

The above subjects are all open to controversy and discussion and further research is necessary.

*Further information on the symposium from the organize*

*CERBOM, 1 avenue Jean Lorrain,*

*06300 Nice, France.*

*Tel: (33) 93 897 249*

## SCIENTIFIC NEWS

### Environmental Impact of Sewage Sludge Disposal at Sea

The U.K. Ministry of Agriculture, Fisheries and Food has issued an analysis of the utility of experimental measures of biological effects for monitoring marine sewage sludge disposal sites.

The report includes an analysis of typical physico-chemical properties of U.K. sewage sludge. Phosphorus is present on average as 1.5 % of dry weight and 0.1 % of wet weight. The report indicates that nitrogen and phosphate in sewage sludge can represent a nutrient resource for phytoplankton populations, thus implying a risk of algal blooms where marine disposal of sewage sludge is carried out in certain specific conditions (confined waters and nearshore areas in particular).

The report suggests that increased algal production resulting from nutrients in sewage sludge is only a problem where blooms of atypical species destabilize the structure of marine communities by excluding other algal species.

The report therefore recommends that the potential of a sludge for causing eutrophication problems in the area involved should be analysed not only by the use of a standard algal assay, but perhaps also by an assay utilising a species known to represent a particular risk in confined waters and nearshore areas.

*Utility of experimental measures of biological effects for monitoring marine sewage-sludge disposal sites, 1990. Aquatic Environment Monitoring Report No.24. M.A.F.F. Fisheries Laboratory, Lowestoft, Suffolk NR33 OHT, England*

### N.T.A. and heavy metals in water

Studies carried out on the sewage treatment works at Bammental near Heidelberg show that the addition of N.T.A. (Nitrilo-triacetic Acid) to domestic waste water causes a significant increase in concentrations of chromium and zinc and a small increase in iron concentrations released from the sewage works. Copper and lead are mobilised in the waste water but trapped by the sewage treatment processes.

If the sewage works is modified, concentrations of nickel and zinc released can be reduced.

The addition of iron during the sewage treatment (for example for phosphate precipitation) reduces the mobilisation of lead, chromium, copper, and nickel.

*Hans-Joachim Schmeiss, "Content of heavy metals in sewage treatment during field tests with N.T.A.", Ruprecht Karls University, Heidelberg, 1990.*

### Elimination of phosphorus in traditional sewage treatment systems

A twelve-month study carried out by Heidelberg University on two sewage works (Bammental and Wiesloch) shows that around a third of the phosphorus present in domestic waste water is removed by a traditional mechanical-biological sewage treatment plant.

In Bammental 40.1 % and in Wiesloch 32.6 % of phosphorus was removed. The difference probably corresponds to the higher loading of the Wiesloch station (functioning at 96 % of its design capacity).

The study also looks at boron, nitrate, ammonium and organic chloride removal.

*German Müller, Frank Ehwald and Astrid Hamann "Long term study on concentrations of phosphorus, nitrogen and boron in mechanical-biological sewage treatment", Ruprecht Karls University, Heidelberg, 1990*

### Phosphates and the Friesian Basin

A symposium held in Leeuwarden (Friesland, Holland) on December 13th 1990, looked at the subject "Phosphates and the Friesian Basin: modelling, action, strategy".

The symposium discussed several studies concerning the phosphate balance and the Friesian Basin hydrographic system carried out between 1984 and 1989 and tried to assess the measures necessary in order to limit eutrophication.

The general conclusion was that agriculture is the principal contributor to eutrophication.

The Stichting Friese Milieuraad (Friesian Environmental Foundation) suggest that the intensity of cattle breeding in the area should be reduced and that household products which contribute to eutrophication should be forbidden.

### Sewage treatment using water plants

Montefluos and Fertec, two companies of the Ferruzzi group, are testing new processes for sewage treatment.

A process currently being tested by Montefluos at Bussi (Chieti) involves spreading domestic waste water on agricultural crops thus combining both irrigation and fertiliser input.

The technique being tested by Fertec in the town of Gorgonzola (Milan area) uses duckweed (Lemna) on lagoons. The plant, which can double in volume in 18 hours, forms a floating carpet over the lagoon which naturally purifies the water over a period of weeks as well as preventing light and oxygen penetrating and thus stopping algal growth.

## SCIENTIFIC NEWS

### Algal blooms in the United Kingdom

A Task Force under the Chairmanship of the National Rivers Authority (responsible for controlling water quality in the UK) was set up in late 1989 to investigate the causes of blooms of blue-green algal scum in UK lakes and reservoirs during the summer of 1989. This Task Force recently published its findings in a comprehensive report.

The report concludes that the key cause of blooms is particular climatic conditions (not just warm weather, for example, but long, stable periods of calm, warm weather followed by winds).

The report notes that reduced phosphate availability would be sometimes effective in preventing blooms but that even total control of point sources is likely to leave diffuse sources adequate for bloom production.

On detergent phosphates, the report does not advocate reductions in their use on the basis that detergent phosphorus rarely accounts for more than 25 % of the load in sewage. Phosphate stripping at sewage works, on the other hand, can be an effective approach to controlling point sources and would of course also remove the input of phosphates from detergents.

The report points out that there is nothing new or unnatural about blue-green algae forming in scum and that there is a need to educate the public to be aware of the dangers and to avoid scums of live and decaying algae which can be toxic by contact or ingestion.

*Further information: "Toxic Blue-Green Algae A Report of the National Rivers Authority", NRA Anglian Region, Kingfisher House, Goldhay Way, Orton Goldhay, Peterborough PE2 OZR, ENGLAND.*

### Environmental impact of P-free detergents

A recent study carried out by the Textile and Chemical Technology Institute (CSIC, Barcelona) and published in *Tecnologia del Agua* (XI n° 77, 1991, Spain), confirms results previously obtained by the Pasteur Institute Lyon, France, concerning environmental impact of phosphate-containing and phosphate-free detergents.

The study looked at four detergents (solid and liquid formulations, with and without phosphates) purchased in Spanish shops in 1990. The Institute warns that the results from such a small sample cannot be generalised.

Results obtained were as follows :

- suspended matter : much higher levels in solid formulations with the P-free solid having significantly higher levels than the P-based solid
- organic carbon content and chemical oxygen demand : significantly higher for the P-free liquid
- biodegradability : very low for the P-free solid
- ecotoxicity : higher for the liquid formulations, in particular the P-free liquid

*Further information : Instituto de Tecnologia Quimica y Textil, CSIC Jorge Girona Salgado 18-26, 08034 Barcelona*

## OTHER NEWS

### Progress Report on French Detergent Manufacturers' Agreement with Government

The French Environment Ministry has issued a progress report on the different actions agreed in the Conventions signed with the AISD (Association des Industries des Savons et des Détergents) in 1989 and 1990.

All packets sold in France now include advice on washing and dosage and the AISD and its members replied in 1990 to around 500 consumer enquiries concerning water hardness and 5 000 concerning washing methods.

An advertising campaign in the Brittany area (aimed at explaining to consumers that the area's water, being soft, requires only reduced detergent dosages) is analysed. A budget of 1.8 million FF enabled around 50% of the area's housewives to be reached - of these, 80% had understood the basic message.

The AISD estimates that phosphate use in detergents dropped by 16% in France in 1990 and that zeolite use increased by 64%.

As agreed with the Government in May 1990, phosphate content of detergents is being reduced to an average 20% by July 1991, EDTA is being progressively reduced (NTA is not used in France in household detergents) and major detergent manufacturer in the AISD has introduced at least one P-free brand.

*Further information : AISD, 118 avenue Achille Peretti, 92200 NEUILLY SUR SEINE, France*

# SCOPE NEWSLETTER

IN EUROPE

Number One : December 1990

## EDITORIAL

Scope (Scientific Committee on Phosphates in Europe) is a non commercial European association (Association Sans But Lucratif) based in Brussels whose objective is to provide a platform for objective and scientific information on phosphates and the environment.

Scope's members include international groups based in Belgium, the UK, Sweden, France and Spain, producers of a wide variety of detergent ingredients including phosphates.

The aim of the Scope Newsletter is to provide a brief summary of new scientific information being published concerning phosphates and the environment and of new legal, administrative or technical developments concerning detergents, phosphates and the environment across Europe. Addresses are provided in order to enable you to obtain further information directly from the scientist or organisation concerned.

The Scope Newsletter is open to input from its readers across Europe and we welcome all comments or information, which should be sent to the address below. Contributions from readers can include comment on the studies mentioned in the Newsletter, information on relevant scientific studies or papers, etc.

## SCIENTIFIC NEWS

### Phosphate substitutes

#### German scientists question use of P-free detergents.

Recent statements by two German scientists, Dr. Ulrich Horstmann (researcher at the Kiel Institute for Marine Research) and Diplom Ingenieur Günter Leymann (expert in water treatment) have attracted considerable interest both in the media and with scientists and water authorities in Germany.

Dr. Horstmann, in a number of press interviews, comments that the main substitute used in P-free detergents is zeolite A. This product poses no particular environmental problems but is only a partial substitute so that other substances (eg. NTA, polycarboxylates : PCA) are also included.

In places in Germany, concentrations of NTA in drinking water have reached 13 to 17 microgrammes per litre (in Switzerland, the maximum tolerated concentration is 3 microgrammes per litre).

Dr. Horstmann also suggests that PCA's are non-biodegradable in certain conditions and, although scientific research is lacking, would appear to concentrate heavy metals, imply technical problems for sewage sludge dehydration and trigger algal growth in the marine environment by chelating trace metals.

*Further information : Dr. Ulrich Horstmann, Institut für Meereskunde an der Universität Kiel, Düsternbrooker Weg 20, 2300 Kiel 1, Germany.*

### Phosphate recycling

#### Pilot plant allows recycling of phosphates in sewage

A large scale pilot plant for sewage dephosphatation using a so-called "pellet reactor" is currently being tested in Holland.

Reports recently published show that it is possible to obtain an effluent containing only 0.5 mg/l total phosphorus and that the phosphorus extracted can be recycled for use in the detergent or fertilizer industries.

The reports show that the reduction in phosphate concentrations in Dutch sewage resulting from decreasing use of phosphates in detergents is making the project's economic viability more difficult to achieve (average levels have dropped from 14,5 mg/l in 1987 to 10 mg/l in 1990 due to the introduction of phosphate-free detergents).

With lower sewage phosphate levels, effluent levels of 4.6 mg/l after dephosphatation are achieved with a higher elimination yield but lower overall phosphate quantities available for recycling.

*Further information : Dr W.C. Witvoet or Ir. A.J. Joha, DHV Raadgevend Ingenieursburo BU, Po Box 85, 3800 AB Amersfoort, Holland.*

### Symposium

#### Marine Coastal Eutrophication Conference, Bologna, March 1990

During a four-day conference organised by Regione Emilia-Romagna, over 150 scientific papers were presented and discussed concerning the study of eutrophication in marine coastal waters and possible solution methods.

Papers presented included analyses of the relationship between nutrient loads and eutrophication, and work on different methods of reducing nutrient levels including treatment of sewage, reduction of agricultural fertilisers, planting and management of marshlands which act as a nutrient filter.

One paper analysed the consequences of discharges of detergents containing or not containing polyphosphate compounds into the marine environment. Based on over 150 bioassays, the work presented by Cerbom, Nice, France,

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indicates that there is "no strong ecological evidence that can sustain proposals for a compulsory elimination of detergent phosphates". The paper notes that detergent phosphates are inevitably replaced by other compounds whose "consequences might be potentially even more harmful for ecological equilibria" in particular by disactivating telemediators, i.e. exocrine substances produced by one species which inhibit the growth of other algal species, thus possibly triggering excessive growth.

*"Effects of detergents on eutrophication and related ecosystem disequilibria" Aubert, Stern, Guillemaut-Drai, Cerbom, Nice, France.*

*Full information on the conference "Marine coastal eutrophication: the response of marine transitional systems to human impact: problems and perspectives for restoration" (Bologna, Italy 21-22-23-24 March 1990) from Scientific and Organisational Secretariat, Assessorato Ambiente Difesa del Suolo, Via dei Mille 21, 40121 Bologna, Italy.*

## Toxic algae

### Straw solution for algae

A farmer who left a bale of hay which had fallen into his pond may have provided a key to dealing with phosphates and nitrates in the water.

He noticed how the algae had begun to diminish and following this chance observation scientists at the Sonning Aquatic Research Unit near Reading in Berkshire, England, have successfully used straw to control growth.

They believe they may have found a non chemical method of cleaning up Britain's water. It is thought that as straw decomposes it provides a good home for bacteria which utilise nutrients such as phosphates and nitrates which would otherwise produce algae.

The scientists have found that barley straw is most effective against the algae. Mr. Pip Barrett, head of the Sonning Research Unit, says the treatment has been tried on different kinds of blue-green algae similar to that which killed sheep and dogs in Leicestershire.

In Wales, an experiment with straw showed that it increased tiny water shrimps from a handful to over 250,000/sq m providing valuable food for trout.

Says Mr. Barrett: "The straw works best when it is submerged."

It takes about a month of soaking the straw for it to begin to work and it seems to work better if scattered loose into the water. Replacement two or three times during the algae's growing season is necessary.

The straw appears to control both the microscopic unicellular and filamentous algae with as little (in the laboratory) as 100 g dry weight of straw per cubic metre of water. Even less might be required if the water entering a pond or waterway filters through the straw.

Fortunately the decomposition of straw is fairly slow in barley straw and no significant drop in dissolved oxygen in the water has been measured.

*Further information: Mr. Pip Barrett, Aquatic Weeds Research Unit, Sonning Aquatic Research Centre, Broadmore Lane, Sonning-on-Thames, Reading RG4 0TH, UK.*

## Polycarboxylates

### Analysis of the environmental effects of polycarboxylates

Polycarboxylates are a complex organic compound used particularly in the formulation of phosphate-free detergents (e.g. to enhance the deterative properties of zeolites).

The Phosphates and Water Working Group of the Association of German Chemists published in December 1989 the conclusions of a comprehensive study of the environmental effects of polycarboxylates (PCAs).

Around 19,000 tons of PCAs were used in German detergents (which are 95 percent phosphate-free) in 1989. Concentrations of around 3 milligrams per litre are usual in sewage, leaving around 0.3 milligrams per litre in treated effluents and 0.05 milligrams per litre in receiving surface waters. The concentrations in drinking water should remain under the present detection limit of 0.01 milligrams per litre.

PCAs are non-biodegradable and although more than 95 percent are eliminated in sewage treatment plants, finishing up in the sludge, this is seen as a definite disadvantage. PCAs in sludge appear to have no negative action on soil or plants and due to their high molecular weight are not transported down to underground water and do not bio-accumulate. The report however considers it unacceptable in the long-term that no analysis method exists able to efficiently trace PCAs in sewage and in surface waters.

*Full report available from: Association of German Chemists, Gesellschaft Deutscher Chemiker, Varrentrappstrasse 40-42, Postfach 900440, 6000 Frankfurt 90, Germany.*

## Sewage Treatment

### Göttingen City Authorities question use of P-free detergents

Friedrich Jütting, Manager of the Office of the Göttingen Office for Water Protection and Dr. Wolfram Eisener, Manager of the Göttingen Sewage Plant Laboratory, suggest that the city authorities should consider recommending a return to the use of phosphate-based detergents. Göttingen has recently opened a 1.5 Million DM sewage dephosphatation unit permitting the removal of detergent phosphates from sewage. The two officials consider that the use of phosphate detergents would thus be advantageous for the protection of the quality of the river Leine and of the North Sea, given that little is known about the fate of phosphate substitutes such as zeolites and polycarboxylates in the environment.

*Further information: Stadlichersamt für Wasser und Abfall, Danzigerstrasse 40, 3400 Göttingen, Germany.*

# SCOPE NEWSLETTER

IN EUROPE

## OFFICIAL AND CONSUMER NEWS

### *Phosphate limitation*

#### **France opts for low-key detergent phosphate limitation and further research**

The French Environment Minister, Mr. Brice Lalonde, published on 29th May 1990 an official report into detergent phosphates and the environment, commissioned over a year ago from Professor Roland Carbiener of the University of Strasbourg.

Following this report, and in agreement with the International Soap and Detergent Association, the Environment Secretary defined the following measures :

- limitation of tri-polyphosphate levels to 25 percent (as from 1.1.91) and 20 percent (as from 1.7.91) in new products. Phosphates are already currently used at around these levels in French detergents,
- each detergent manufacturer will sell, by 1.1.91, at least one phosphate-free detergent. This is already generally the case,
- EDTA will be limited and NTA will not be used in France. This corresponds to the existing situation,
- an expert committee led by Mr. Poly (previously President of the French Agricultural Research Institute) will look into aspects of the environmental effects of detergents, both phosphate-containing and phosphate-free formulations.

*Further information is available from the French Environment Ministry, 14, bd General Leclerc, 92524 Neuilly-sur-Seine Cedex, France.*

### *Consumer protection*

#### **Swedish Market Court condemns advertising of P-free detergent**

On 15th June 1990, the Swedish Market Court pronounced judgement on a complaint brought by the national Consumer Ombudsman against the company Nordtend A.B., concerning the marketing of the "Sulpho without phosphates" detergent.

Nordtend's advertising included a press advert headlined "Sulpho without phosphates for the sake of the environment" and included a statement : "It is phosphates - primarily from agriculture but also from many detergents - that are contributing to the overfertilization of our lakes and waterways. In rural areas, where sewage works lack the resources to combat these phosphates, Sulpho without phosphates is of major benefit in enabling us to keep the countryside exactly as we want it."

The court considered that to say, without reservations, that Sulpho without phosphates is good for the environment is misleading and improper and that it had been made clear that Sulpho without phosphates contains components which do have an adverse effect on the environment. This Swedish judgement confirms the rejection of eco-advertising already seen in the French commercial courts judgement earlier this year which ordered Henkel to stop its advertising campaign for Le Chat phosphate-free detergent, associating the product with the protection of the environment, and withdraw existing packets from shops.

In Britain, the Committee of Advertising Practice which governs television advertising in the U.K. has issued a code of practice indicating that environmental advertising claims must be supported by sound factual evidence and that "categorical statements such as environment friendly, safe or green are unlikely to be appropriate to any mass produced product."

These moves across Europe demonstrate a general tendency to put an end to uncontrolled eco-advertising where mass products, for instance certain brands of detergents, are claimed to be environmentally friendly despite the absence of any overall evidence to support such claims. The EC is also currently working on the definition of a European "Green Label" scheme.

*Information : Consumer Ombudsman, Konsumentombudsmannen (KO), Box 503, 162 15 Vallingby, Sweden.*

### *Water quality*

#### **Swedish water authorities indicate their preference for phosphate based detergents in certain circumstances**

The Stockholm Water Board has launched an information campaign concerning washing powders and liquids, dish-washing detergents and cleaning products. The principal objective of the campaign is to encourage households to use smaller doses of products, but adverts also include a request that consumers use phosphate based detergents in city areas.

A press advert includes the following text : "Contribute to the environment of Stockholm - use detergents based upon phosphates or citrate and tartrate. Modern sewage treatment plants are very efficient at removing detergent phosphates ; they are not at all so good at removing the substitutes for phosphorus used in P-free detergents. Many of the latter reduce our ability to purify sewage in an effective way."

The advert indicates that P-free detergents are suitable for use in the countryside (without full sewage treatment facilities) and phosphate based detergents for city use.

*Information : Stockholm Water Board, Stockholm Vatten, Box 6407, 113 82 Stockholm, Sweden.*