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VERSLAG
ir. C. van der Burgt

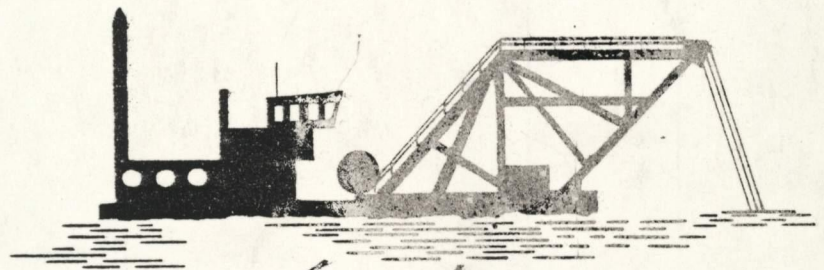
Ninth meeting of U.S. and Japanese Experts
on the Management of Bottom Sediments
containing Toxic Substances

17/19 oktober 1984, Jacksonville

Netherlands
Ministry of Transport
and Public Works

Memorandum of Understanding

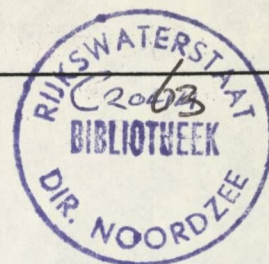
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VERSLAG Ninth meeting of U.S. and Japanese Experts
ir. C. van der Burgt on the Management of Bottom Sediments
containing Toxic Substances

17/19 oktober 1984, Jacksonville

Het doel van dit bezoek aan de U.S. was vierledig:

- 1) Bijwonen - op verzoek van Col. George Kleb en mr. Bill Murden van het U.S. Army Corps of Engineers (CE)- van bovengenoemde meeting.
- 2) In overleg met de U.S. en Japanse gedelegeerden nagaan, welke mogelijkheden voor integratie van de bijeenkomsten in het kader van de MOU^S U.S.-Japan en U.S.- Nederland er zijn.
- 3) Bespreken programma Mou-meeting 1984 in Charleston.
- 4) Bespreken mogelijkheden voor Nederlandse presentatie in New Orleans in kader of tijdens de Wereldtentoonstelling aldaar.

1. Ninth Meeting MOU U.S.-Japan

Ongeveer 40 personen, waarvan 13 uit Japan, namen deel aan de vergadering en de discussies.

De te behandelen onderwerpen lagen op het gebied van de milieuproblemen door baggeren en olieverontreiniging.

Er werden 18 voordrachten gehouden, 8 door Amerikanen en 10 door Japanners.

De laatstgenoemden namen meestal theoretische beschouwingen in hun bijdragen op. De Amerikanen waren meer praktisch gericht.

De voordrachten gingen over de volgende onderwerpen:

- 5: - waterkwaliteit en opname door levende organismen;
- 5: - de kwaliteit van bodemsedimenten en het verwerken ervan;
- 5: - de opslag en het nuttige gebruik van baggerspecie;
- 2: - diversen: de London Dumping Convention en nauwkeurige navigatiehulpmiddelen in de St. Lawrence Seaway.

Korte overzichten en de conclusies van de rapporten zijn als bijlage hierbij gevoegd (de volledige teksten zijn op aanvraag beschikbaar).



Bij de behandeling van de onderwerpen viel in het bijzonder op:

- De slechte reputatie die baggerspecie en het baggeren in de wereld hebben. Het is nuttig het baggeren als een grondwerk te beschouwen, waarbij de verplaatste grond vaak weer een nuttige bestemming kan krijgen. Daarom: "dredged material management" in plaats van "disposal of dredged spoils".
- De met veel nadruk door de Japanners gebrachte studies over verbetering van de waterkwaliteit door het opheffen van stratificatie door middel van luchtbellen. Over de geweldige kosten voor het gedurende enkele warme weken per jaar toepassen van deze methode op enigszins grotere schaal werd niet gerept.
- In Tokyo Bay werken sinds 1974 twee oliebestrijdingsschepen (Catamarans) die zowel lichte olie kunnen opzuigen via een drijvende stuw, als zware olie en teerballen via een cilindrisch scheprad. De lichte olie wordt met luchtbellen van het water gescheiden en via een tweede stuw verzameld en opgezogen. De productie van deze systemen is resp. ca. 60 m^3 lichte olie/dag en $15-30 \text{ m}^3$ zware olie/uur (testresultaten). Ook werken de Japanners wel met emulgerende stoffen die olie in "mousse" veranderen, die vervolgens met schepnetten e.d. kan worden opgeschept.
- Sommige wateren in Japan zijn sinds de oorlog zo vervuild, dat zij een sterke stank verspreiden. Wegbaggeren van de vervuilde specie nam in bepaalde gevallen de bezwaren geheel weg. De turbiditeit t.g.v. het baggeren blijkt reeds op enkele honderden meters van de zuiger uitermate gering te zijn.
- Een Japanse proef met een gedraineerde opslag had een zeer snelle droging van de baggerspecie tengevolge (na 10 dagen). Een Amerikaanse bijdrage beschreef een mechanische ontwatering van belang voor kolenslurrie, maar ook voor baggerspecie. De kosten bij toepassing op grotere schaal liggen hoog.
- Heel interessant waren U.S.A.-bijdragen over het zoeken naar een toekomstige landberging van specie bij New York en over de nu bijna voltooide eilandberging in de Chesapeake Bay t.b.v. de geul- en havenverdieping van Baltimore. Het grootste deel (95 - 98%) van de New Yorkse baggerspecie is niet vervuild. Voor de rest wordt nu overwogen deze te gebruiken als afdeklaag over een enorme vuilstort. Gezien de stijgende kosten voor afdekgrond lijkt dit een haalbare oplossing. Daarnaast bestaat de mogelijkheid kunstmatige eilanden voor berging te gebruiken.

De overige specie wordt naar zee gebracht (Ocean Dumping).

- Over de eilandberging in de Chesapeake Bay wordt nog documentatie toegezonden. Deze heeft deels een proefkarakter. Een delingsdijk in het midden bevat een overloop, waar het effluent van de in het ene bekken geborgen baggerspecie wordt bewaakt. Het water uit het andere bekken wordt gebruikt om de specie uit de baggerbakken mee te verpompen. Hierdoor behoeft voorlopig geen water uit het eiland in de baai te worden geloosd.
- Een ander interessant onderdeel van het project is de "mud wave dam", een onderwaterdam rondom de uitlaat van het eiland, die moet voorkomen dat met slib beladen water via deze uitlaat in de baai komt. Bovendien kan hier zonodig een zuiveringsinstallatie op gebouwd worden om het effluent naar de baai zoveel mogelijk te reinigen.
- De kwel via de ringdijk werd berekend op slechts $10 \text{ ft}^3/\text{dg}$ is ongeveer $1/4 \text{ m}^3/\text{da}$ waarbij men ervan uitging dat deze zanddijk langzamerhand ook nog dicht zou slibben. Met piëzometers wil men de werkelijke lek bepalen. Overigens is de verwachting, dat door het ontstaan van een anaerobe toestand onder in de berging verschillende zware metalen niet in opgeloste toestand zullen komen en daardoor moeilijk door het zandfilter van de ringdijk kunnen passeren.
- Steeds meer moet gestreefd worden naar nuttig gebruik van de specie. Het W.E.S. in Vicksburg (Bob Engler) gaat na in hoeverre visteelt (aquaculture) in baggerdepots mogelijkheden zou bieden. Gezien het hoge nutriëntengehalte lijkt dit aantrekkelijk. Hierbij kan men bij hogere metaalgehalten ook denken aan voedsel voor huisdieren en aas voor hengelaars.

2. Integratie MOU^S U.S.-Japan en U.S.-Nederland

Van U.S.A.-zijde werd erop aangedrongen dit (nog) niet te doen. De onderwerpen in de MOU U.S.-Japan zijn sterk beperkt tot de milieuaspecten. Men achtte de regeling met Nederland, die meer ruimte laat voor andere interessante onderwerpen, veel aantrekkelijker.

Wël werd overeengekomen over en weer vertegenwoordigers uit te nodigen.

De Japanse Co-chairman mr. Yamashita is geïnviteerd om eventueel met landgenoten aan de bijeenkomst in Charleston deel te nemen.

Ook Frankrijk heeft verzocht een MOU met het Corps of Engineers te mogen sluiten (!).

3. Programma bijeenkomst Charleston

Besloten is deze te houden in de 3e week van September 1984 (17-22 sept.) i.v.m. de U.S.-schoolvakanties die dan juist zijn geëindigd.

Voorts werd met de Co-chairman (Murden) en een aantal leden van het C.E. afgesproken de formule van de bijeenkomst in Rijswijk opnieuw te volgen en een deel van de bijeenkomst aan workshops te wijden.

Het voorlopig program zou er dan als volgt uitzien:

- maandag : - presentaties over de Deltawerken en over het voor de Oosterschelde gebouwde materieel;
- idem van U.S. zijde over het Tennessee Valley project
- dinsdag : - algemene inleidingen over baggeronderwerpen;
- 's-middags excursie kanaalwerken nabij Charleston;
- woensdag : - 3 workshops (hele dag) over:
. Beneficial uses of dredged materials;
. Management of contaminated dredged material;
. Navigation Channels in open sea and in large estuaries;
- donderdag : - voortzetting workshops en plenaire zitting over de onderwerpen van de workshops;
- 's-middags bezoek aan de havenwerken en de onderhouds-baggerwerken in Charleston;
- vrijdag : - nabeschouwingen en bespreking onderwerpen te behandelen in 1985;
- mogelijke excursies volgens nadere afspraak en wens van de Nederlandse gasten.

Tijdens de workshops worden door verschillende deelnemers presentaties over gespecialiseerde onderwerpen samenhangend met de thema's gehouden. Evenals de vorige keer worden niet alleen personen van de overheid, maar ook van aannemersbedrijven, ingenieursbureaux, scheepsbouw en wetenschappelijke instituten uitgenodigd. Voor de workshop voor navigatie wordt ook gedacht aan nautische deskundigen bijv. van de KNRV en MARIN.

Binnenkort moeten de uitnodigingen worden gedaan.

De voorstellen van de I.H.C. voor bepaalde presentaties (training op baggergebied en verpompen van kolenslurry) kunnen daarbij in de reeks onderwerpen worden ingepast.

4. Nederlandse presentatie tijdens Wereldtentoonstelling in New Orleans

Bill Murden voelde veel voor een overleg op technisch niveau tussen rivier- en estuaria-deskundigen. Hij zei alle hulp toe van het Corps om een seminar te organiseren.

Herbert Haar (adj.dir. Haven van New Orleans), die ik op 19 sept. voor mijn vertrek nog juist ontmoette, raadde af om contact op te nemen met de World Fair. Alleen degenen die grote inzendingen verzorgen krijgen de kans presentaties te houden in het kader van de Tentoonstelling.

Nederland is dit niet van plan. Hij steunde het idee om in het "International Trade Mart"-gebouw, waar ook het Havenbedrijf gevestigd is, een bijeenkomst te organiseren. Het bestuur van dit gebouw wil heel graag tentoonstellingen hebben in de grote lobby van het gebouw. Dit zou bv. gedurende 2 weken kunnen plaatsvinden, in welke periode ook de Ned. presentatie gehouden kan worden. Een en ander moet nu spoedig in overleg met Deltadienst, Ned. Consul in New Orleans, Haven van New Orleans, Int. Trade Mart, Jurgens in Washington, het Corps, geregeld worden.

Mr. Haar vertelde, dat het management van de beneden Mississippi en de kustzône vallen onder het begrip "Coastal Zône Management", waar met name de staat Louisiana hard aan werkt. De afslag van de kust van Louisiana van 16 mijl²p.j. is een nog onopgelost probleem, waarin de berging van baggerspecie uit de rivier slechts een ondergeschikte rol kan spelen.

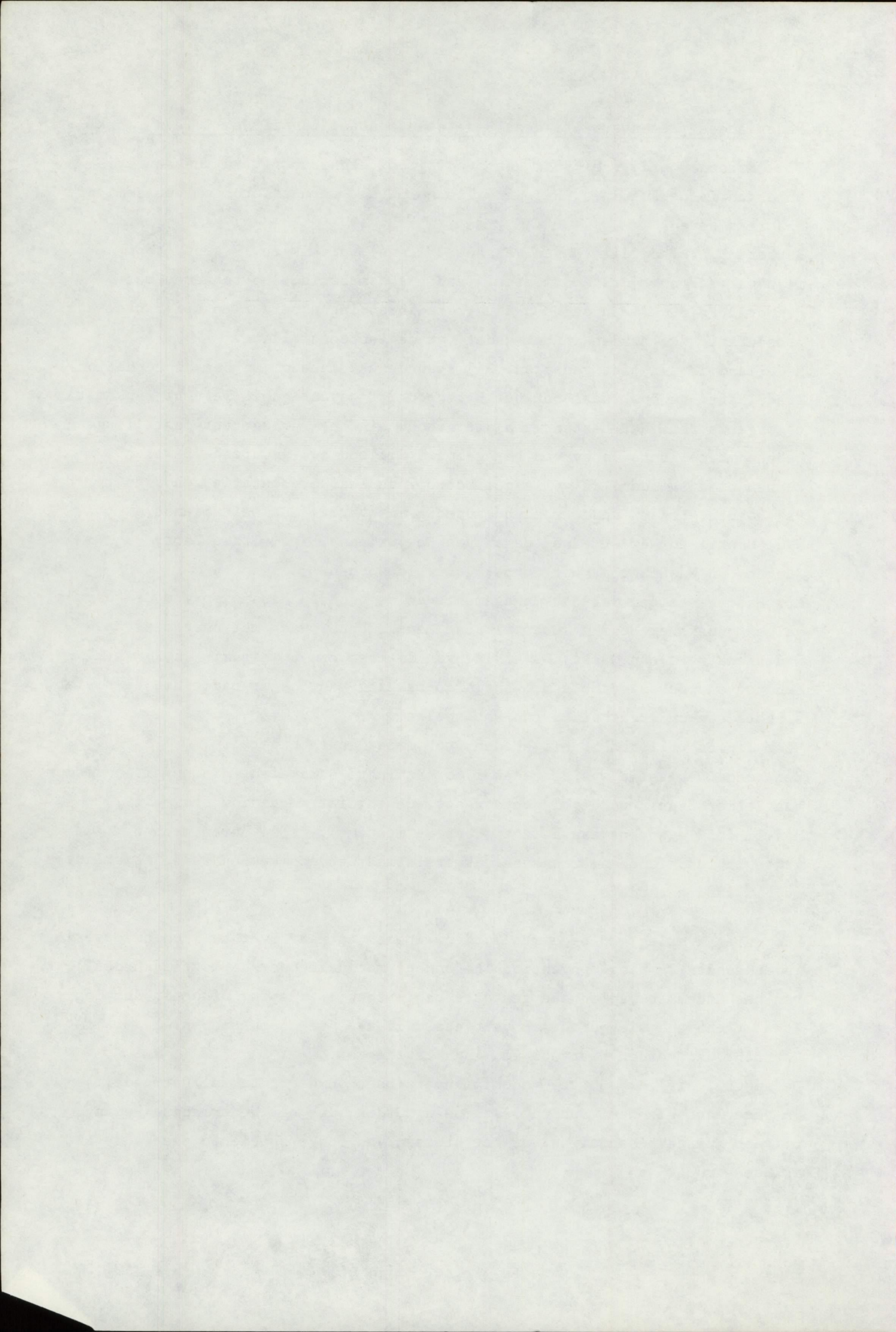
Hier liggen wellicht mogelijkheden voor Nederlandse expertise.

Een goede suggestie was om general Morris in te schakelen, die nu als adviseur van Volker Stevin wordt bijgestaan door de zojuist gepensioneerde Col. Max Imhoff (eveneens aanwezig tijdens de meeting). Beide heren hebben grote invloed in de Amerikaanse vakwereld, maar tevens kennen ze de Nederlandse mogelijkheden terdege.

5. Voorts is overleg gepleegd met Murden, Engler en Haar over het komende overleg in de London Dumping Convention in Londen, met name over de mogelijkheden van het afdekken van in zee gestorte baggerspecie (capping of ocean dumping). Zowel technisch als juridisch valt daarover veel te discussiëren.

Getracht zal worden hiervoor één lijn te trekken.

De specie, die in U.S. als gecontamineerd beschouwd wordt, zal vermoedelijk in Nederland als heel schoon bestempeld worden, dus het Nederlandse belang bij een juiste behandeling van het storten van baggerspecie in zee in de LDC is heel groot.



6. Met Eugene Harlow en prof. John Herbich, beiden lid van een werkgroep die in opdracht van het Corps nagaat welke problemen de U.S.A.-havens hebben om tot verdere ontwikkeling te komen, besprak ik o.a. de aanpak van PIANC-werkgroepen.

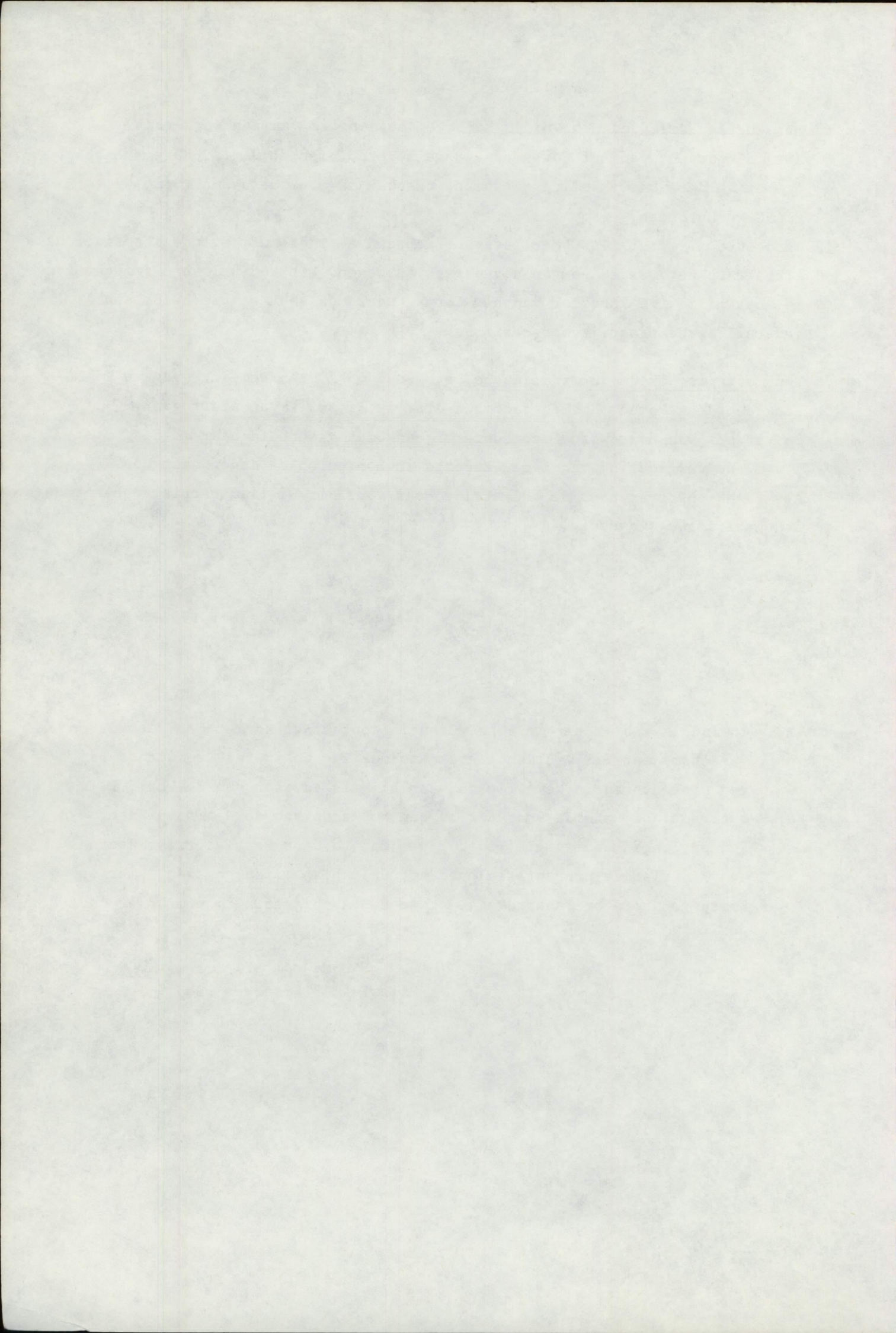
In de U.S.A. wordt PIANC heel sterk beschouwd als het maatgevende internationale lichaam op het vakgebied van havens en vaarwegen. Dit kon wel eens samenhangen met het militaire karakter van het Corps, waar men veel waarde hecht aan gedetailleerde praktijkvoorschriften.

7. Tenslotte is ook de internationale werkgroep on "Ocean Dumping" van de PIANC aan de orde gekomen, die in december a.s. in Rijswijk van start gaat. Op verzoek van Haar wordt voor deze bijeenkomst gestreefd naar 15 dec. a.s. i.v.m. de vergadering van Legal Experts in Londen op de dagen daarvoor. Als PIANC-observer naar de LDC stelde Haar voor Sir William Harris te benoemen. Een heel goede suggestie!

Rijswijk, 21 oktober 1983.

P.S. Inmiddels heb ik bij de PIANC-Council contact gehad met Gen. Morris en (wederom) met Bill Murden. Eerstgenoemde zag ook weinig resultaat bij een presentatie in New Orleans waar hij als advisor van de World Fair optreedt. Hij stelde voor dat in een workshop van de National Waterways Foundation in Louisville (Kent.), gesponsord door het Waterways Journal, een Nederlandse presentatie over het Deltaplan wordt gegeven. Hier komen de grote opdrachtgevers uit de U.S.A. bijeen. Hij komt hier nader op terug.

Rijswijk, 31 oktober 1983.



HYPOLIMNETIC OXYGEN DEFICIT IN A EUTROPHIC LAKE
AND THE ROLE OF SEDIMENT OXYGEN DEMANDMitsumasa Okada¹, Mitsuru Takasaki²,
Ryuichi Sudo¹ and Atsuhisa Sato²

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ABSTRACT

Lake surveys and *in-situ* experiments were conducted to study the hypolimnetic oxygen deficit in a eutrophic lake, Lake Yunoko. A mathematical model where the production of oxygen by the photosynthesis of phytoplankton, the consumption by the respiration of microorganisms, sediment oxygen demand, and oxygen transfer by the eddy diffusion and reaeration at the surface of water were taken into consideration, was developed to estimate the dissolved oxygen budget in the lake. It was shown from the budget that the sediment oxygen demand play an important role in the first stage of the hypolimnetic oxygen deficit in summer, i.e. the oxygen produced by the photosynthesis was not transferred into the hypolimnion and the contribution of the sediment oxygen demand was as large as that of the consumption in water. Restoration techniques for the oxygen deficit such as management of bottom sediment and the control of phytoplankton production were discussed. The management of bottom sediment was shown to be an effective way to control the hypolimnetic oxygen deficit in Lake Yunoko.

CONCLUSIONS

Based on the results obtained from lake surveys and *in-situ* experiments at the first stage of thermal stratification and analyses of DO profiles by a simulation model, the following conclusions can be made:

1. The rate of sediment oxygen demand was determined by *in-situ* submerged chambers. The rate per unit area was in proportion to dissolved oxygen concentration.
2. Rates of oxygen consumption in water decreased along the depth of water. The rate in the bottom layer was only one-tenth of that in the surface. Rapid decrease in DO at the bottom layer was found to be due to high rate of sediment oxygen demand.
3. Although oxygen produced by the photosynthesis was transferred by the eddy diffusion into deeper layers, it disappeared at around middle layers and was not utilised to compensate hypolimnetic oxygen deficit.
4. Remarkable restoration from the hypolimnetic oxygen deficit was not expected by the control of phytoplankton production. The control of sediment oxygen demand was found to be a effective restoration technique in Lake Yunoko.

EXPERIMENTAL STUDY ON THE AERATION EFFECTS
ON MARINE EUTROPHICATION

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ABSTRACT

This report briefly presents the result of the study on the application of an aeration system to marine environment. A multi-hole tube type aeration device is tested in a nearly closed sea area and the effectiveness of the system mainly in destratification is confirmed. This study which includes preliminary studies on actual examples, experiments in the laboratory, experiments at the sites, development of simulation systems, etc., has been done and is being continued mainly by the Fifth District Port Construction Bureau of the Ministry of Transport.

CONCLUDING REMARKS

From the study mentioned so far, the aeration can be an effective method to improve marine environment. However, it seems to be necessary to do more detailed study and improvement of the method, such as studies on the effects of a system in which several types of air blowing tubes are combined and operated in wider sea area, on the effects of longer time operation, on the effects of intermittent operation and on the effects of blowing air rate. Furthermore, it seems to be necessary to compare the cost-performance of the aeration method with that of alternative countermeasures.

Possible alternatives will include countermeasures to reduce the release of COD, etc. from the sea bottom such as sediment dredging, covering sea bottom with clean sand layer, etc. and countermeasures to promote replacement of eutrophic sea water with fresh one by pumps or other means.

ACCUMULATION OF ACRYLAMIDE INTO FISH

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ABSTRACT

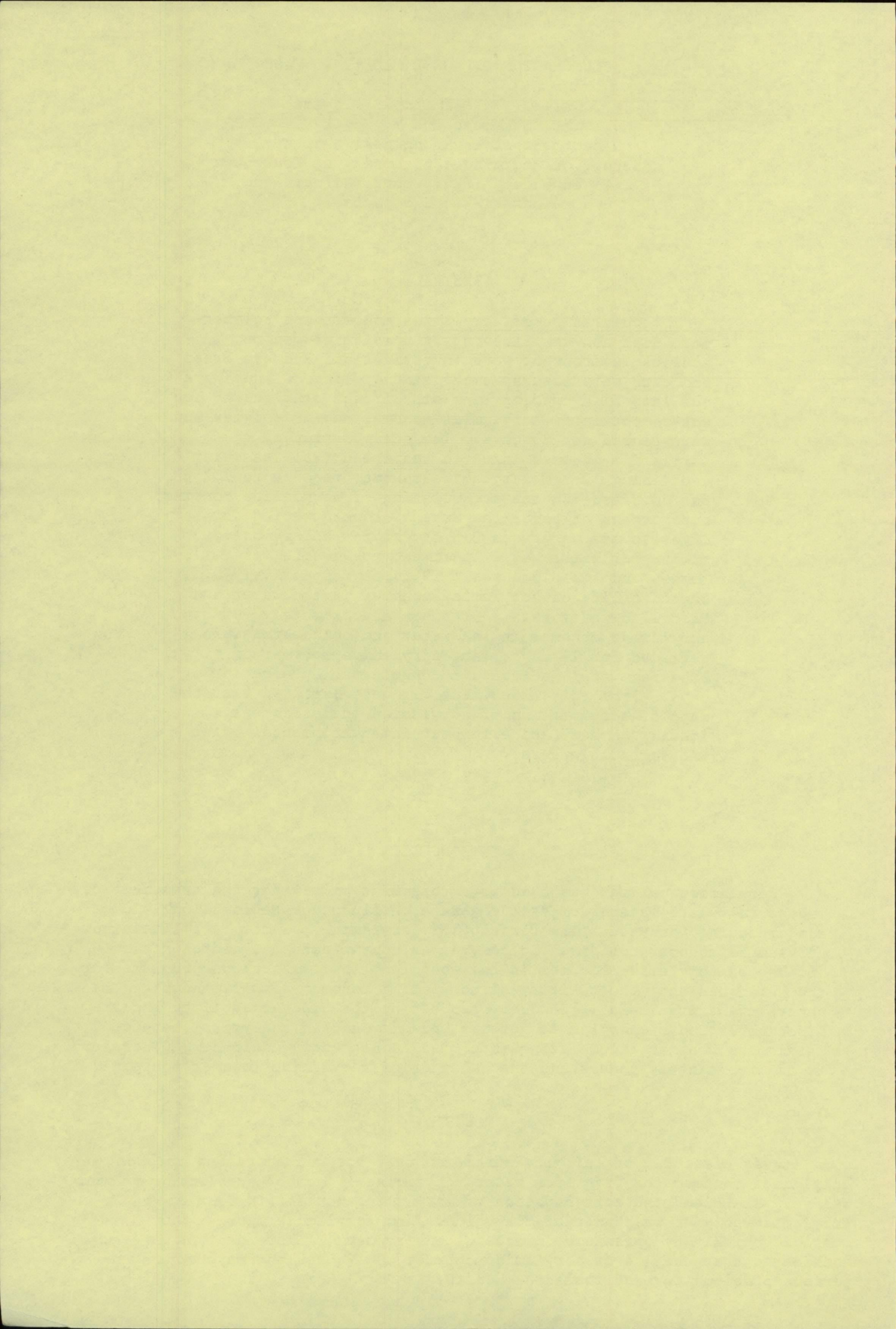
Accumulation of acrylamide monomer and polymer into fish and the behavior of acrylamide monomer in aqueous environment were investigated. Red sea bream and carp were used as experimental fish. Fishes were put into fish rearing tank with fresh water and/or sea water containing acrylamide monomer and/or polymer and were reared for 25 days. The accumulation of acrylamide monomer into red sea bream from sea water containing 10 ppm acrylamide monomer reached to 1.2 ppm for 20 days. On the accumulation of acrylamide monomer into organs of carp, the rate of concentration for liver to sea water was 0.5 times, for kidney was 0.5 times, for gills was 0.15 times, for muscle was 0.17 times, and for blood was 0.19 times respectively. Degradability of acrylamide monomer in tap water and distilled water were a little. Approximately 90% of acrylamide monomer in sea water and pond water were degraded for 14 days. And acrylamide monomer in breeding water decreased to undetectable value for 5 days. From this experiment, it was clarified that the rate of accumulation of acrylamide into fish was a little and acrylamide monomer in environmental water was degradable easily.

INTRODUCTION

Acrylamide polymer was used as a coagulant widely for the treatment of industrial waste water, domestic sewerage, effluent of reclamation, sludge and dredging work etc. The toxicity of acrylamide polymer is a little but acrylamide monomer contained in polymer as contaminant has neurotoxicity. And use of acrylamide monomer in the coagulant invites serious problems for the human health. The toxicity of acrylamide monomer is well known and many papers are there (1-15). However, reports on the biodegradability and the bioaccumulation of acrylamide monomer were few and an analytical method of acrylamide monomer accumulating into fish is not known until now. Therefore, it is important to understand the behavior of acrylamide monomer contained in

CONCLUSION

It was clarified by this investigation that the concentration rate of acrylamide monomer for fish from water containing 10 ppm of acrylamide monomer was very small and the concentration of acrylamide monomer in fish from acrylamide polymer was undetectable value. And acrylamide monomer was degraded quickly by organisms in aqueous environment. Therefore, it is considered that the use of acrylamide polymer as a coagulant may not invite serious problems for environmental health.



SPILT OIL RECOVERY FOR ENVIRONMENTAL PROTECTION
-To Prevent Sea Bottom from Contamination by Solidified Oil-

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ABSTRACT

In the last decade, the total number of reported pollution-incidents in Japan has decreased by 36%. Oil spillage accounts for nearly 80% of total pollution incidents. Three typical oil recovery systems currently being used in Japan are discussed in this paper. The first one is aeration separating oil recovery system which is intended for recovery of low viscosity oil that spreads itself over the water surface as a thin film. The second, rotary bucket oil recovery system, recovers high viscosity oil, like crude or heavy oil, which remains on the water surface in a thick layer, and the third, gelatinization recovery system, solidifies every type of oil into mousse for easy mechanical recovery.

CONCLUSION

Discussed in this paper were three typical oil recovery systems currently used in Japan;

- 1) Recovery system for low viscosity oil which spreads itself over the water surface as a thin film layer.
- 2) Recovery system for high viscosity oil, like crude or heavy oil, which remains on the water surface in a thick layer.
- 3) Gelatinization recovery system which solidifies every type of oil into mousse for easy mechanical recovery.

In spite of the many oil spills which occur on a world wide or even a regional basis, there are not usually enough spills in a given local area to make it cost effective to maintain single purpose oil spill recovery ships. It would be more feasible economically to have ships, such as tugboats or dredges, which can perform other missions besides oil spill recovery. As a matter of fact, some such ships have already been built.

The ships with gelatinization oil recovery system introduced in this paper are normally used for recovery of floating refuse in harbors and dispatched as oil recovery ships upon occurrence of oil spills.

The authors will be pleased if such oil recovery systems should contribute to maintaining the world's irreplaceable and beautiful sea environment.

in

Tsu-Matsusaka Harbor

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Abstract

The pollution control project in Tsu-Matsusaka Harbor is reported in the 6th meeting. At that time, dredging work did not started.

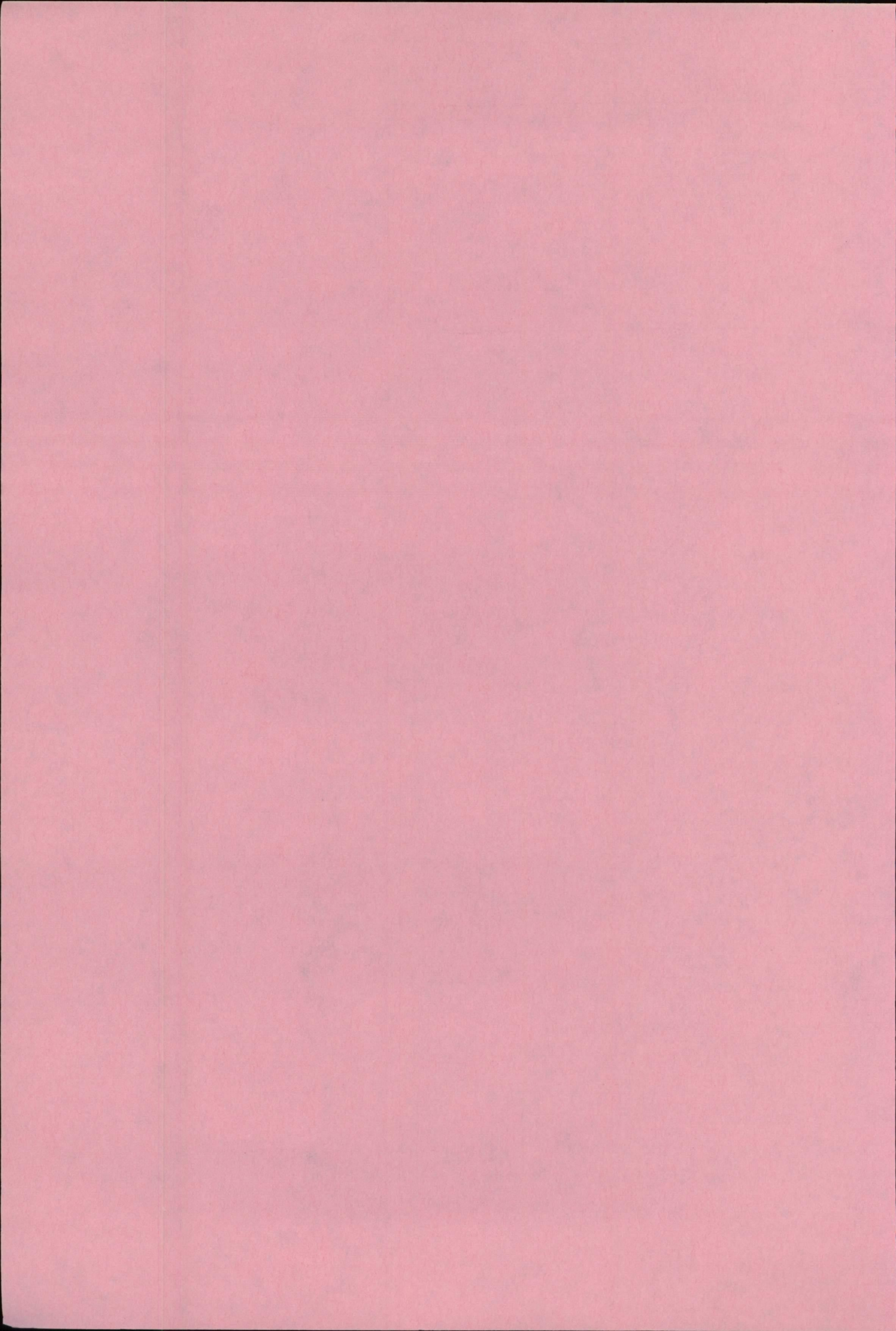
At present dredging work in Shitomo River was finished and in Iwata River dredging work is continueing. As these two rivers flow into the harbor, the pollution of the harbor water was caused by them. Therefore to improve the harbor water it is necessary to rehabilitate their estuaries. This paper deals with an outline of the dredging work therein.

6. Conclusion

After the dredging work in Shitomo River smells disappeared thoroughly. There occurred no complaints about smell from residents.

It is also observed that water birds come flying and fishes and shellfishes increase. It appears that the effects of dredging are revealing themselves by and by.

For any pollution control project it is most important to do work safely and smoothly without the complaints of local residents. From this point of view, it seems that our work is achieving the expected aim. However there remains to study the problem of to what degree the river estuaries in Tsu-Matsusaka Harbor can have been rehabilitated.



in
Sediment Pore Water by Dialysis Sampler

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Abstract

In relation to the release mechanism of nutrients, it becomes necessary sometimes to investigate the behavior of nutrients in sediment pore water.

The separation of pore water from sediment was hitherto performed by a centrifuge or a filter press. In these methods nutrients are released dynamically by artificial forces during the water separation. But the release action in nature is quite static. Therefore dynamic separation brings about quite different results from the static process in nature.

To solve this problem, Mayer developed a "Static separation by dialysis" bag (1976).

5. Conclusion

As mentioned before, measurements by the Mayer type dialysis sampler were performed for the first time in our country. These gave us good suggestions for release mechanisms. From this experience, we can say that nutrient concentrations in pore water should be measured by such a sampler, and that the conventional method of using a centrifuge is not suitable.

DISPERSION OF SEDIMENT RESUSPENSION

CAUSED BY DREDGE OPERATION

By

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SUMMARY

As a working model of dispersion of sediment resuspension caused by dredge operation, a model of the turbidity increment according to the distances from the dredge is useful. The increment of turbidity near the sea bottom is estimated 5 ppm at the distance of 100 m and 3 ppm at 200 m from the dredge. Also, it is a fact that the increment of turbidity near the water surface never exceeds that around the sea bottom. Therefore, it is not worth fearing that dredging work will make a wide area of the sea turbid.

CONCLUSION

Since the dispersion of sediment resuspension caused by dredge operation depends upon the turbulent flow of the sea water, it is quite difficult to arrive at a prediction by applying a mathematical model. Therefore the practical solution is only to show an empirical model of turbidity distribution. Such a model cannot be expected to be accurate unless a statistical analysis is given by observing numerous practices of dredging. However, it is also true that to carry out observations of turbidity using numerous practices is a problem. This is a dilemma accompanying prediction of the dispersion of sediment resuspension.

There is the increasing voice of environmentalists claiming that the bad effects of turbidity of the sea water are harmful to the life of fish and seaweeds. Therefore, it is necessary to secure the understanding of those environmentalists by fashioning an accurate model concerning the dispersion of sediment resuspension caused by dredge operation, in order to safely carry out dredging work to maintain the sound development of the economy. For that purpose, to add up as many practical observations of turbidity as possible is a must, overcoming all conceivable problems to achieve this end. The writer sincerely hopes that this report will be of some help in realizing these goals.

AN ANTI-TURBIDITY OVERFLOW SYSTEM (ATOS) USED FOR REDUCING THE
DISPERSION OF FINE SEDIMENTS FROM A DREDGE PLUME

by

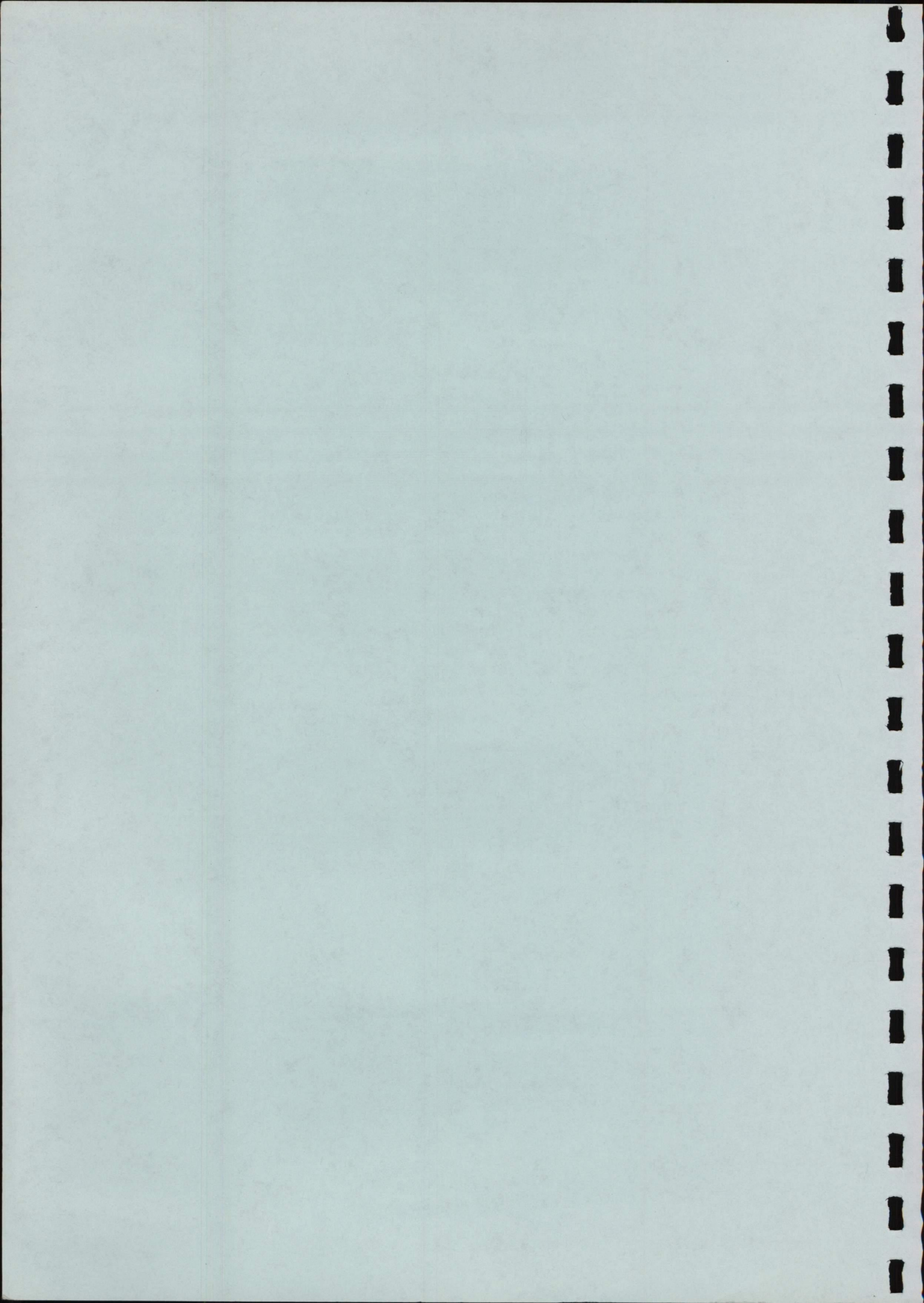
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Abstract

In 1976 at the World Dredging Conference in San Francisco, California, U.S.A., two Japanese authors, Ichiro Ofuji, Manager of IHI Special Vessels Design Department, and Naoshi Ishimatsu, an engineer in the same department, submitted a prizewinning technical paper entitled, "Anti-Turbidity Overflow System for Hopper Dredger." By the removal of air trapped in the overflow slurry from a hopper dredge, and the placement of the overflow below the water line, reductions in visible surface plume effects were achieved by a factor of 40 in silty sands. The effects were not so noticeable in coarse sands. The U.S. Department of the Interior (DOI), Minerals Management Service (MMS), is responsible for managing the production of minerals from the Outer Continental Shelf (OCS). In an effort to further quantify the effects of installation of an ATOS on a dredge used for mining offshore, the MMS and the United States/Japan Cooperative Program in Natural Resources (UJNR) are preparing a test to take place in Shimonoseki-Port in Northern Kyushu. The purpose of the test is to characterize the magnitude and behavior of turbidity plumes associated with a dredging operation with and without ATOS. Plume characteristics, including magnitudes in 3 dimensions--trajectory, density, density gradients and suspended sediments, will be measured as a function of time. The test is planned for the spring of 1984 from the dredging vessel, Kaiho-Maru.

At a meeting of the Joint Scientific Committee, ATOS project, held in Tskuba, Japan, on May 27, 1983, it was resolved to carry out tests in May 1984 using the dredge, Kaiho Maru, operating in Kanman Channel at the Port of Shemonoseki in Northern Kyushu (Figs. 4 & 5). Turbidity from the action of the draghead on the seabed will be examined in the experiment as well as turbidity from the hopper overflow discharge, with and without ATOS. Measurements of plume magnitudes in three dimensions, plume trajectory, plume density, density gradients and suspended sediments will be taken at selected points during the dredge operating cycle to characterize the magnitude and behavior of the plumes (Table 2). Background measurements at selected points will be taken before and after the tests.

It is hoped that sufficient data will be gathered to allow assessment of the value of installing ATOS equipment on dredges used for mining offshore to mitigate the formation of environmentally undesirable sediment plumes.



MECHANICAL DEWATERING

OF

DREDGED SLURRIES

by

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ABSTRACT

Over the last five years, significant developments have occurred in dewatering, using belt press technology, computer finite element modeling for structural design, improved high molecular weight preconditioning chemicals and advanced belt weave and strength characteristics have all been key factors.

A 2.5 meter wide heavy duty belt press can dewater high density sludge at a rate of 20-30 T/hr (dry basis). The unit is the largest factory preassembled module, and thus transportable from site to site, ready for mounting on a concrete slab, truck mounted or could be mounted on a barge to eliminate dredge to shore pumping and piping problems. Energy required for dewatering will be equal or less than current energy levels expedient when pumping from dredge to shore. We anticipate that an 83% volume reduction would occur when converting a 15% solids dredged slurry to a 70% solids cake.

Near term, belt press dewatering may especially fit into dredging operations where confinement is necessary or where chemical contamination is present in the dredgings and total solids capture is necessary. Final cake may be placed directly into berm or dike construction, or where chemical contaminants build up significantly, chemical fixation is feasible.

CONCLUSIONS

1. Current practices in belt press coal dewatering suggest that similar success can be achieved on a portion of dredgings extracted from U.S. rivers and harbors. Combinations of advanced technology in computer structural modeling, high molecular weight polymers and improved filter belt life are now available for the filter press process.

2. Near term application may exist for dredged slurries contaminated with chemicals because:

- a. Volume reduction by up to 83% would permit more positive control and confinement of the dewatered cake in designated landfill areas.
- b. Containment of the chemicals within the solids and direct discharge of the filtrate is possible.
- c. Reduction of a portion of the 55 million cubic yards to 9.5 million yards may accelerate the rate of dredging at reduced cost.

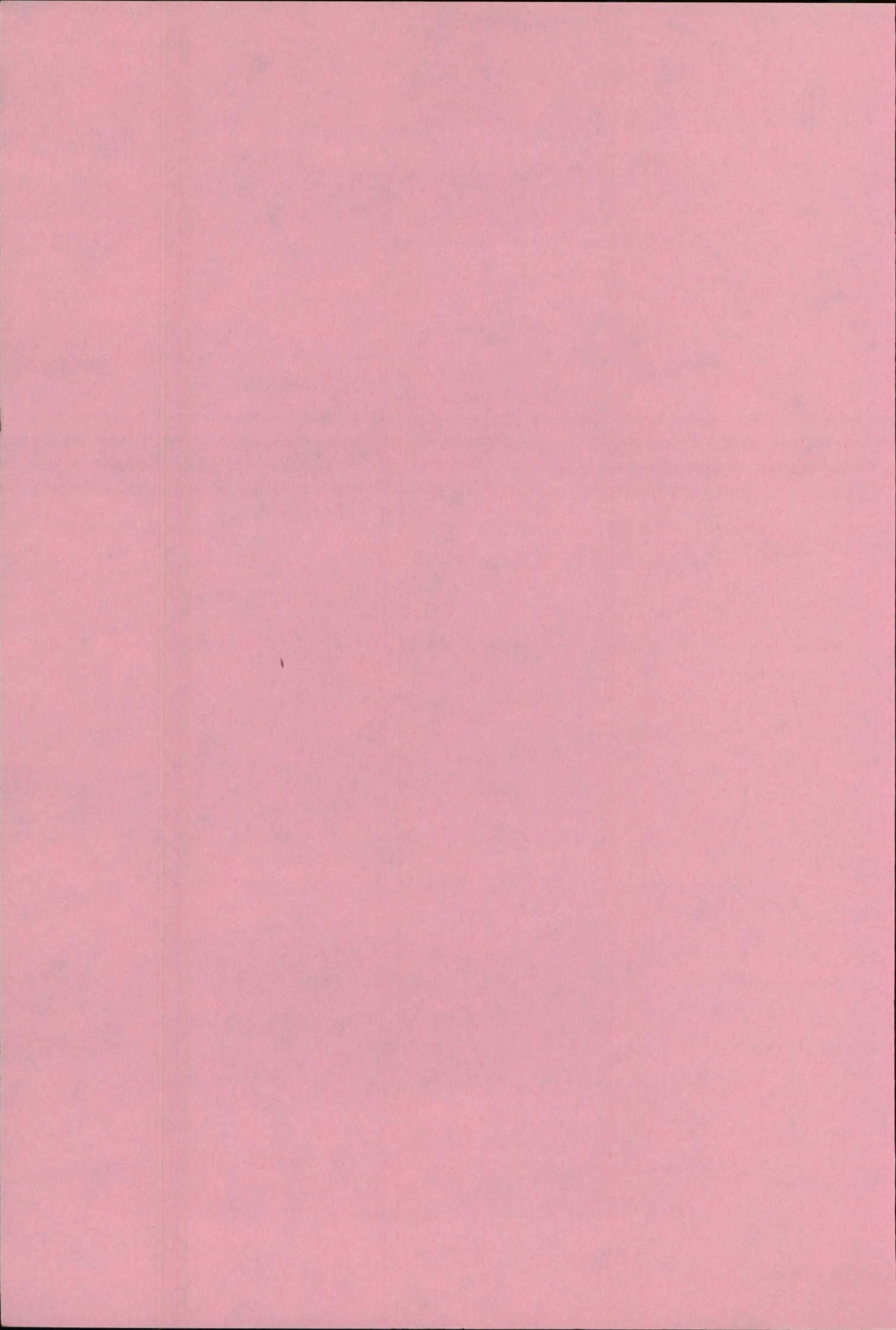
3. The 2.5 meter modular belt press can be applied to a number of site specific dredging scenerios:

- a. Adapted for off-shore barge mounted system, for dustpan, a cutter head or deeper pneumatic dredging.
- b. On-shore, semi-fixed where an immediate dike or berm formation is required.
- c. Truck mounted, with week to week movement, paralleling river dredging is possible.
- d. Confined, shallow mudcat type dredging and dewatering is possible.

4. Specific bench test technology has been developed to define the proper site specific applications.

5. Volume reduction achieved by dewatering can then add certain options to the overall dredging management program:

- a. Chemical fixation where necessary.
- b. Prolong the fill life of existing adjacent impondent areas.
- c. Provide more immediate seasonal cropping or revegetation.



by

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Prepared for Presentation

at the

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On Slurry Transportation

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The centrifuge has been the primary dewatering equipment used for pipeline coal slurries. Experience with the Black Mesa pipeline at the Mohave Power Station has demonstrated the overall economics. While the centrifuge has produced a dry satisfactory cake product, 7% to 10% of the pipeline feed is lost in the underflow. This fraction which is less than 325 mesh in size, represents a potential loss unless steps are taken to recover it. Understandably it also represents the most difficult to dewater in terms of dollars per dry ton. This paper deals with evaluating various options based primarily on using a continuous belt filter press. The nature of the coal fines require a methodology which permits not only evaluating various options but also predicting the full scale economics.

SUMMARY

Based on studies conducted on both Black Mesa and ETSI pipeline coal slurries, the continuous belt filter press would be a feasible dewatering device for the centrifuge underflow. In both instances a less than 20% solids feed was dewatered to approximately 55% solids concentration. There were indications that with added hydraulic capacity, the belt press would also reduce the dependency on the clarifier thickeners efficiency at the Mohave Power Station.

The results on both pipeline slurries, Black Mesa and ETSI, also confirmed the validity of Rexnord's original concept of adding a quantity of pipeline slurry to the centrifuge reject to improve overall dewatering.

EXPERIENCES IN LAGOON ALGAE REMOVAL
AND
ADVANCED SECONDARY TREATMENT WITH MICROSCREENS

BIJLACE 9b.

BY

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INTRODUCTION

The main purpose of the microscreen process is to separate solids from liquids in the water and wastewater treatment field. The microscreening cycle, which consists of a medium such as stainless steel or polyester mounted on a rotating drum is an operation analogous to the declining rate filter; as the screen passes from submergence to emergence during the screening cycle, the headloss characteristics of the developing cake increase and cause a decrease in the hydraulic throughput rate (1). Solids separation is accomplished by a series of interactions between three phases:

- Solids separation (screening and cake)
- Transfer of screened solids to removal zone
- Removal, generally by backwashing

During the final phase, or backwash cycle, the accumulated solids are removed from the medium by either air or hydraulic mechanisms. Generally, microscreen effluent water is used for hydraulic clearing. The hydraulic loading (gpm/ft^2) is the sum of the quantity of water produced during the filtration cycle and the quantity of water consumed (actual screen penetration) during the backwash cycle divided by the net effective submerged area (sq. ft.).

There are several independent and dependent variables that control the microscreen process. The variables are listed in Table 1 (After Cravens and Kormanik, 1978) (2).

CONCLUSIONS

With the advent of the 1, 6, 10, 17, and 21 micron polyester medias, microscreening, "State-of-the-Art" has rapidly been developing for the past two to five years.

The use of one micron media in the area of lagoon upgrading (algae removal) is unsurpassed by previous upgrading methods. A few of the microscreen advantages over dissolved air flotation and pressure filtration are:

- a. Lower manpower requirements
 - b. Low power cost
 - c. Low operation and maintenance costs
 - d. No chemicals required to sustain a good quality effluent
 - e. Lower backwash return rates
 - f. Self cleaning backwash nozzles
 - g. Grid replacement is simple and cheap
 - h. More flexibility in its operation mode
-
- i. The microscreens effluent suspended solids levels achieved are well within the EPA's prescribed standards. In most cases the microscreen removes enough suspended solids to lower the BOD levels well below the 30 mg/l standard.

Microscreen performance on secondary effluents using 6 and 21 micron polyester can produce effluent quality levels in the 10-30 mg/l range over a wide loading range of 30-300 mg/l suspended solids. When periodic plant upsets due to:

- a. sludge bulking
- b. improper wasting
- c. shock loadings
- d. high SVI
- e. hydraulic surges

the microscreen can accommodate any of these upsets by adjusting these operating parameters:

- a. drum speed
- b. headloss
- c. hydraulic loading
- d. media selection
- e. backwash pressure
- f. mat or pre-coat formation.

Quick Dewatering Test of Dredged Material in Situ

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Abstract

In the treatment of dredged material sundrying is the most popular. This method necessitates a long desiccation period such as about 10 months, and a large space. Difficult conditions like these hinder the advancement of water pollution problems, especially of lake restoration. For the implementation of pollution control projects it becomes necessary to dewater dredged material as quickly as possible and to overcome the unfavourable conditions mentioned above.

Driven by such a necessity, a quick dewatering test was conducted in Lake Suwa. This paper reports the test results.

4. Conclusion

As mentioned before, we have obtained unexpectedly good results in our tests. The concept that water in dredged material should be drawn out to the direction of gravity, is verified by the test.

In our country, there are many cases in which dredged material must be layed in ponds temporarily and after dewatering transported to final disposal sites. For such cases, the bottom drainage method is very effective, because large quantities of dredged material can be treated even in small ponds.

Although the basic points regarding to this method was cleared, there remain several points which should be improved for practical application.

Theoretical Considerations on the Test Results of New Drainage from Bottom

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Abstract

In Lake Suwa a test of quick dewatering of dredged material performed in situ. An outline of this test is reported in this meeting by Nakamura. This is based on the new idea that dredged material is dewatered from the pond bottom by gravity. The test not only brought good results, but also gave us many interesting suggestions from the point of soil mechanics.

This paper deals with the theoretical considerations of these test results, in which dewatering behavior is discussed from various points of view.

7. Conclusion

In the management of dredged material, the most important matter is to dewater it as quickly as possible. Given such a necessity, out test on bottom dewatering was conducted. Although drainage behavior by gravity was investigated from the earliest days, such practical applications as in our test seem rare.

It was found that the dewatering of dredged material from the bottom is very effective in shortening desiccation time and for lowering the desiccated water content. Besides these effects, we have learned much about the drainage behavior in dredged material as viewed from soil mechanics.

Theoretical Consideration on Basic Factors
of
Pond and Spillwater Treatment Design

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Abstract

In the treatment of dredged material, we must determine the necessary factors for pond design or spillwater treatment design. To learn them some laboratory tests are performed. If the test results are evaluated correctly, there is no problem. However it seems that it is not always easy to evaluate them theoretically.

For example the mean settling velocity of solid particles is usually obtained as the angle of the tangent line to the descending curve of the clarified liquid boundary. Strictly speaking, this is not correct. This paper deals with such problems.

6. Conclusion

As mentioned before, the settling tube test is the most popular method for the planning of settling ponds and spill water treatment. However it seems that there is little doubt about the correct evaluation of test results. We are convinced that our theoretical analysis of this problem would be useful.

DRAFT

ALTERNATIVES TO OPEN WATER DISPOSAL OF CONTAMINATED DREDGED MATERIAL

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ABSTRACT

Of the 8 to 10 million cubic yards of dredged material generated each year from the New York Harbor Area 2% to 5% has been determined to be unacceptable for unrestricted ocean disposal. Three disposal options are being studied to accommodate this unacceptable material: use of dredged material as sanitary landfill cover, upland disposal and containment areas and islands. In a dewatered state, dredged material could be used as a substitute for traditional cover material at sanitary landfills. Chemical and engineering tests were performed on representative dredged material from New York Harbor and it was determined that all material is environmentally acceptable and may be economically feasible for this use. Potential upland disposal areas (barren areas) were evaluated using environmental and socio-economic criteria to eliminate unacceptable sites. A containment area and island siting criteria was developed to eliminate highly biologically productive areas in New York Harbor from consideration. Further efforts for all three disposal options are being directed at site availability, social acceptability and detailed environmental and economic studies. All three options appear to be technically feasible. Sanitary landfill cover may prove to be a use of dredged material as a resource. However, the most problematic aspects of these disposal options involves their social acceptability rather than technical aspects.

DRAFT

CONCLUSIONS

The dredged material disposal options discussed in this report appear to be technically feasible. These three options are potentially applicable to 2% to 5% of the 8 - 10 million cubic yards annually dredged from the Port of New York and New Jersey.

The feasibility studies for the sanitary landfill cover option have resulted in the development of siting criteria and regulations concerning use of this option. Dredged material may provide a valuable source of cover for landfills in the New York/New Jersey Port area provided that it proves to be economically feasible. Upland disposal siting has located 13 potential upland disposal sites. Some of these could be used as dewatering sites for use of dredged material as sanitary landfill cover. Containment areas and islands could be sited in four areas of the port region. Containment areas and islands could be used as dewatering and rehandling sites for use of dredged material as sanitary landfill cover or developed after being filled as parklands or industrial areas. The large containment island concept has been eliminated by the New York District due to several factors, especially the difficulty of locating an, environmentally acceptable area and the cost (2 to 3.5 times the cost of ocean disposal).

All three disposal options appear to be technically feasible. However, the major obstacle in implementing any of these options appears to be public acceptance rather than technical issues.

SUBSURFACE INVESTIGATION FOR DREDGING PROJECTS

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ABSTRACT

Dredging and tunnel projects have achieved considerable notoriety within the geotechnical community. In reviewing the history of many of these projects, it becomes apparent that the reputation arises not from a failure to adopt so-called "state-of-the-art" technology, but rather a failure to organize investigations to address anticipated problems and to understand the significance of the data acquired. Even when these two elements are present, projects flounder when those charged with executing the work do not have a clear grasp of the engineering properties of the materials they are likely to encounter. As dredging techniques are more frequently being used to correct environmental problems, the techniques of investigation and data management will assume greater importance. The problems of establishing the types of data to be acquired, the extent of the data, and how it is to be used are still with us. Failure to address these problems rigorously results in excessive costs, unsatisfactory project results, and in some cases, abandonment of projects altogether. This paper relies upon some old and simple concepts of experimental statistics to assist in quantifying the reliability of subsurface data. Only rarely is this technique used in practice and yet it is a powerful tool when it is combined with experience.

Geotechnical investigations are conducted by geotechnical engineers for the use of others. In that respect, they must be comprehensible to other than

geotechnical engineers. In the field of dredging, geotechnical data is perhaps the key element entering into the estimate of project cost, the latter of universal interest. It is exceedingly rare that a geotechnical engineer will find himself preparing cost estimates for a dredging project, although he may be consulted with respect to certain aspects of that data.

The last element of Figure 1 contains the normal mechanisms for transferring data from the investigator to the user. The last element in this Figure requires a brief comment.

The U.S. Army Corps of Engineers has authored many publications intended to provide guidance in the acquisition and dissemination of geotechnical data. They are excellent guides to investigation and presentation of data and they should be familiar to any geotechnical engineer who accepts the responsibility of a dredging project. One statement merits a direct quote.

"Particular attention will be given in clearly presenting those characteristics of rocks that will convey to the contractor accurate information on excavation problems whereby he can determine what excavation methods and procedures will be involved. Complicated descriptions of scientific interest, but not pertinent to the excavation problem, will be eliminated."⁽³⁾

If the term "materials" is substituted for "rock", the paragraph is sage advice of universal application in dredging.

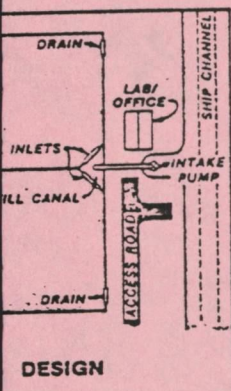
The task of the geotechnical engineer remains that of describing the engineering properties and variability of the materials likely to be encountered. The techniques are well known. It remains only to make certain that these techniques are used and that the results are presented in a manner that is informative to those charged with execution of the project.

AQUACULTURE IN DREDGED MATERIAL CONTAINMENT AREAS

Proceedings

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SUMMARY

Parties involved in commercial containment area aquaculture could realize significant benefits from multiple use of dredged material containment areas (DMCA). Freshwater and coastal DMCA offer the benefits of desirable location (often near large markets and on major transportation routes), access to good water sources, and reduced construction and maintenance costs to aquaculturists/entrepreneurs. Local interests could gain from the development of DMCA aquaculture through increased employment opportunities and enhanced tax revenues.

A financially profitable multiple use of containment areas would benefit owners of disposal acreage and, through increased site availability, would benefit the Corps of Engineers. The property owners would receive compensation for the use of their land initially as a disposal area as well as through subsequent operations by aquaculture interests. This would serve as a financial incentive to other property owners to make acreage more readily available for disposal. In addition to the improved real estate availability, the Corps of Engineers would benefit from the positive publicity generated by its efforts to cooperate with local interests and from promoting the productive use of what had heretofore been popularly perceived as biologically and economically unproductive acreage.

CONCLUSIONS

The conclusions of the plenary session and group discussions were that aquaculture in active DMCA appears to be a feasible, cost-effective, and compatible multiple use of DMCA. With rare exceptions, currently available technology can probably be directly applied to DMCA aquaculture, making the concept practical with little additional research and development investment required.

Aquaculture as a secondary use of DMCA has potential to be both profitable and desirable. Demonstration projects under varying field conditions and research directed at the potential problem areas are recommended. Field demonstrations would ideally be conducted as joint ventures between industry and the government agencies that would be involved. The thoroughly documented results of field trials would provide the springboard to greater acceptance of the concept by industry, dredged material managers, and the owners of potential DMCA acreage. The potential for cost savings appears to exist both in those cases where the local sponsor furnishes the disposal areas and in those instances where the Federal government is responsible for furnishing and operating disposal areas. In the significant instances where the Federal government is the dredging project's sponsor, and holds title to DMCA acreage used by the project, the government could lease the acreage to aquaculturists under conditions that would ensure multiple beneficial use of the real estate. Lease fees could be (a) returned to the General Treasury, (b) returned to the CE to reduce project costs, (c) managed to assist local or regional economic development through contributions to social assistance or Civil Works construction programs, (d) applied toward regional or national environmental enhancement or mitigation, or (e) any combination of the above. Those problem areas and research needs identified during the workshop are considered tractable and would not hinder the application of this concept. The technical information shared at the workshop and the support generated for this concept by the represented agencies and interests provide a solid foundation for the further development of DMCA aquaculture.

SAINT LAWRENCE SEAWAY PRECISE NAVIGATION

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PRELIMINARY CONCLUSIONS

The St. Lawrence Seaway precise navigation problem is relatively unique and technically demanding.

No single electronic positioning system currently available can provide the necessary combination of accuracy and reliability required to allow all-weather vessel movements throughout the Montreal-Lake Ontario portion of the system in the absence of conventional navigation aids.

The current accuracy requirement is estimated by the Seaway entities at ± 7 meters (or just under ± 25 feet), absolute.

The accuracy and reliability requirements for a replacement system must be expressed in absolute, rather than probabilistic terms, since no vessel master can be asked to subject his vessel to a 5 percent or even a 1 percent probability of grounding or collision.

To meet stringent Seaway reliability requirements, a combination of additional conventional aids (more ranges and fixed lights) and two or more additional systems will most likely be needed.

Radar will likely be one of the component systems, and an integrated display is highly desirable, if not required for user acceptance.

Based on preliminary results of ongoing grid monitoring and field testing activities it is clear that, even with some form of differential corrections, the present Northeast LORAN-C chain cannot provide the accuracy necessary for safe navigation in the Montreal-Lake Ontario section of the St. Lawrence River. However, installation and operation of a LORAN-C transmitter north of the River could significantly improve grid geometry to the point that LORAN-C might provide the necessary accuracy.

We have been unable to identify any other currently available, off-the-shelf system capable of solving the problem, although a number of available systems could provide useful supplemental information to the St. Lawrence Seaway navigator.

Systems which are being examined for their potential contribution include PRANS (Precise Radar Navigation System), Racons (Radar Beacons), MLS (Microwave Landing Systems), Sonar positioning systems, follow-the-wire systems, various electronic positioning systems such as LORAN-C and Raydist-T, several microwave systems, laser systems and night vision enhancement devices.

The Navstar Global Positioning System (G.P.S.) currently under deployment by the the U.S. Department of Defense, is another candidate system under consideration. Utilizing differential techniques, some sources claim to be able to achieve accuracies on the order of 0.2 meter with G.P.S. Accuracies at this level would make G.P.S. a prime candidate for both precise navigation and maintenance uses.

