SHELL OIL COMPANY

PLAINTIFF'S EXHIBIT
SH-2382

DEER PARK
MFC COMPLEX
OCT 8 1976
GENL MANAGER
SUPT CHEMICAL
SUPT OPER I&R
SUPT OPER O&S
SUPT ENGR
ENG SUPT CHEM
SUPT ENV CONS
SUPT TECH
MGR E&S
MGR MAINT
SPV SECURITY
SUPT REFINERY
CHIEF TECH.
SUPT OPER E
SUPT OPER W
SUPT UTILITIES
MGR DISPATCH
MGR E&S
MGR ENG FIELD
CONTROLLER
MGR EMP REL
SUPT MAT PROJ

DATE OCTOBER 7, 1976

MANUFACTURING - ENVIRONMENTAL CONSERVATION DEPARTMENT - MANAGER

FROM SENIOR STAFF ENGINEER - MANUFACTURING - ENVIRONMENTAL CONSERVATION DEPARTMENT

SUBJECT WASTE WATER RESEARCH AND DEVELOPMENT - 1977 PROGRAM

This memorandum has been prepared to update the objectives of Manufacturing's Waste Water Research and Development Program in light of recent court actions and to outline R&D activities for 1977. Briefly, the purpose of the R&D program is to provide a data base to achieve cost effective compliance with the next round of NPDES permits which will be issued in 1978 and 1979 for five year periods. Information obtained in the R&D program will be used, in the near term, to support Shell's position relative to effluent regulations being developed by the EPA. For the longer term, the information will be used to select and operate treatment facilities required by the new regulations.

Effluent guidelines for organic chemicals, refineries and plastics and synthetics were remanded to the EPA this year. The entire 1983 refinery guidelines (Best Available Technology Economically Achievable) have been remanded because the EPA relied on multimedia filtration and carbon sorption technology, which had not been demonstrated to be effective in commercial scale application. Both 1977 (Best Practical Control Technology Currently Available) and 1983 standards were recinded for organic chemicals and plastics and synthetics. Development data were used improperly by the EPA which led to unsupportable over-generalizations. As a result of other court action, the EPA are developing effluent limitations and guidelines, new source standards and pretreatment standards for toxic pollutants. Controls are to be established for 65 toxic pollutants. Catagories of point sources for 12 other toxic pollutants are to be identified although specific control is not required. The toxic pollutants are listed in Attachment I. A court directed schedule (Attachment II) calls for promulgation of final toxic pollutant regulations in 1979.

Shell is participating in the development of the new effluent regulations in direct contact with the EPA and with trade organizations. In the very near future we expect detailed inquiries from the EPA concerning waste loads at manufacturing locations and the effectiveness of treatment technology. Surveys by EPA contractors are expected which will include collection and analysis of effluents at selected locations. In addition, the EPA will evaluate the effectiveness of carbon sorption at some locations using a mobile laboratory.

To meet informational needs for the development of regulations and to develop cost/effective treatment strategies, a comprehensive waste water R&D program has been initiated. This program is keyed to the development of analytical methods, the development of optimum biotreater performance and an evaluation of the cost/effectiveness of non-biological waste treatment technology. Effluents from both refineries and chemical plants will be evaluated in this program.

DPMC-08871

cc to RW Bray
" CH Rivkin
No enc

Return to Central Fi

LAM 002739

The 1977 waste water treatment program contemplates staffing for 24 total man-years compared to a 1976 commitment of 22 total man-years. The program provides for 1.6 man years of R&D assistance to locations and Head Office functions. The remainder of the program is described in more detail in the following summaries.

Analytical Support (2.0 man-years)

High priority will be given to the development of a Shell (Westhollow Research Center) capability to analyze for toxic pollutants. The list of toxic pollutants includes 17 inorganic materials and 60 organic compounds or classes of compounds. The class designations are broad categories containing many individual compounds. The analytical procedures considered appropriate by the EPA are still in the development stages. Briefly, metals are to be analyzed by atomic absorption, and organics are to be analyzed by gas chromatographic and mass spectrographic analyses of solvent and gas extracts. The EPA are using a criterion of 1 part per billion (ppb) as a limit of analytical sensitivity. Pollutants will be considered to be absent at lower concentrations. One of the objectives of the analytical program is to narrow the list of pollutants for control by establishing their absence at concentrations of 1 ppb. To simplify regulation, the EPA will be searching for surrogate control parameters which will provide practical means for monitoring and control. For example, surrogate controls could employ analyses such as total organic chloride and total organic carbon.

Because of interferences in the analytical methods and the potential for compositional variation in waste streams, positive exclusion of toxic pollutants will be difficult at the 1 ppb level. However, the analytical program will indentify the major pollutants which pass through secondary waste treatment facilities and therefore are candidates for removal by other means. It follows that analytical programs to characterize waste streams must be closely coupled with programs designed to determine cost/effective treatment technology.

To be most useful the analytical methods should be understood and in hand as soon as possible. This is necessary to be able to independently check samples secured in EPA sampling programs anticipated in 1976 and to provide guidance for the evaluation of treatment technology.

Eventually it will be necessary to characterize effluents from all manufacturing locations with NPDES permits. The scope of the analyses (77 toxic pollutants) is so large that relatively few samples can be fully characterized. In the absence of a sufficient number of analyses to establish variability, each analyzed sample must be defined within the context of current plant production, waste water treating conditions, and general effluent parameters.

Deer Park - Chemical effluent has been selected for initial characterization with the analytical procedures now under development. Sampling will take place

in October 1976. This selection was made because of the potential for a broad range of pollutants in the effluent and because a high performance waste treatment facility is operational. A refinery effluent will be characterized next. Sample scheduling and prioritization will depend on a number of factors. Locations sampled by the EPA will receive priority in the Shell analytical program to insure an independent check on EPA data. Locations discharging into public water supplies, such as the Mississippi and Ohio Rivers, would be given priority also.

By way of illustrating the analytical approach, the sampling schedule for Deer Park - Chemical is given in Attachment III. In addition to the treated effluent, samples will be secured to characterize the biotreater influent and the biological status of the biotreaters. The analyses thus obtained will be placed into operational context with the data on plant operations listed in Attachment IV.

Organic Chloride Removal (2.0 man-years)

Twenty-seven of the toxic pollutants are organic chlorides. This large bloc of toxic pollutants can be monitored as a class (as total organic chloride) and may be so controlled in new regulations. Deer Park - Chemical effluent has NPDES limitations on total organic chlorides. Although Norco - Chemical effluent does not have these limitations now, future NPDES permits will limit organic chloride discharges (as a class or as individual toxic pollutants). Organic chlorides enter the waste water system from a limited number of sources which are candidates for treatment to remove or detoxify the organic chlorides. The purpose of this program is to evaluate treatments which supplement the sorption studies described in the following program.

Non-biological Effluent Treatment (11.2 man-years)

As mentioned earlier, the EPA consider multimedia filtreation and carbon soprtion to be leading candidates for BATEA waste water treatment. The general cost/effectiveness of these treatments has been questioned. If required for Shell manufacturing locations, these facilities are estimated to cost $65 million.

Firm data are needed to establish the cost/effectiveness for specific locations while new regulations are still being developed by the EPA. It is important to recognize that cost considerations are very important since the 1983 regulatory objective is to define Best Available Technology Economically Achievable. Therefore the approach of this program is to define realistic cost ranges for these treatment packages and to experimentally determine effectiveness in terms of general and toxic pollutant parameters. Actual waste streams may contain materials which could seriously influence the effectiveness of such treatments at specific locations. This information would be especially useful

in developing discharge criteria with the EPA to avoid the pitfalls of over-generalization. Therefore actual waste streams from chemical plants and refineries will be tested and conceptual treating facilities will be cost estimated. Effluents from Deer Park (Chemical and Refinery) are to be examined first. Alternative waste treatments will be proposed for further study to remove refractory pollutants and to develop more cost/effective methods to control pollutants.

The experimental approach will involve on-site testing. This is particularly necessary for filtration studies where prolonged storage would changed the filterability of suspended solids.

Biotreating Processes (7.2 man-years)

Previous research has indicated that biotreater performance can be influenced by micronutients in the waste water and by salinity. These leads are being applied to Deer Park Chemical effluent. Specifically, bench scale tests show that optimum iron concentrations can increase organics (TOC) removal by as much as 50%. This enhancement is lost when sulfide is present in the waste and iron is precipitated. Proper control of these parameters may provide opportunities to increase pollutant removal as required without heavy investments in capital.

Salinity affects the growth and metabolism of biota in biotreaters. The salinity of the waste water changes in current operations at Deer Park depending on which process units are operating. In addition, future plans call for process changes at Deer Park which will reduce the salinity of the waste water. Therefore the effect of salinity on Deer Park Chemical biotreater operations is being defined to insure efficient operation.

Finally, the use of powdered carbon in biotreaters has been reported to reduce the toxicity of the effluent and to yield an effluent of more uniform quality. This may provide a cost/effective approach to produce non-toxic effluent at Martinez where fish toxicity is becoming an important effluent control parameter. Plans for a plant test at Martinez are being developed.

/BN Bastian

B. N. Bastian

Attachments

cc - Manufacturing - Plans & Analysis - Oil - General Facilities Support - Manager
Engineering - Products - Process Engineering-Support - Manager
Deer Park Manufacturing Complex - Environmental Conservation Superintendent
Shell Development Company - Shell Research Complex
Chemical Engineering - R&D - Manager
Hydrocarbon Engineering - Mr. W. I. Doty
Analytical - Oil - Mr. M. J. O'Neal

DPMC-08874

ATTACHMENT I

Toxic Pollutants

Substances To Be Controlled

Acenapthene
Acrolein
Acrylonitrile
Aldrin/Dieldrin
Antimony and compounds
Asbestos
Benzene
Benzidine
Beryllium and compounds
Cadmium and compounds
Carbon tetrachloride
Chlordane
(Technical mixture and metabolites)
Chlorinated benzenes
(Other than dichlorobenzenes)
Chlorinated ethanes
(Including 1,2-dichloroethane, 1,1,1,-trichloroethane, and hexachloroethane)
Chloroalkyl ethers
(chloromethyl, chloroethyl, and mixed ethers)
Chlorinated napthalene
Chlorinated phenols
(Other than those listed elsewhere; includes trichlorophenols and chlorinated cresols)
Chloroform
2-chlorophenol
Chromium and compounds
Copper and compounds
Cyanides
DDT and metabolites
Dichlorobenzenes
(1,2-, 1,3-, and 1,4-dichlorobenzenes)
Dichlorobenzidine
Dichloroethylenes
(1,1- and 1,2-dichloroethylene)
2,4-dichlorophenol
Dichloropropane and dichloropropene
2,4-Dimethylphenol
Dinitrotoluene
Diphenyl ether
Diphenylhydrazine
Endosulfan and metabolites
Endrin and metabolites
Ethylbenzene
Fluoranthene
Haloethers (other than those listed elsewhere: includes chlorophenylphenyl ethers, bromophenylphenyl ether, bis (dichloroisopropyl) bis-(chloroethoxy) methane and polychlorinated diphenyl ethers)
Halomethanes (other than those listed elsewhere: includes methylchloride, methylbromide, bromoform, dichlorobromomethane, trichlorofluoromethane, dichlorodifluoromethane)
Heptachlor and metabolites
Hexachlorobutadiene
Hexachlorocyclohexane (all isomers)
Hexachlorocyclopentadiene
Isophorone
Lead and compounds
Mercury and compounds
Napthalene
Nickel and compounds
Nitrobenzene
Nitrophenols
(including 2,4-dinitrophenol, dinitrocresol)
Nitrosamines
Pentachlorophenol
Phenol
Phtalate esters
Polychlorinated biphenyls (PCBS)
Polynuclear aromatic hydrocarbons (including benzanthracenes, benzopyrenes, benzofluorathene, chrysenes, dibenzanthracenes, and indenopyrenes)
Selenium and compounds
Silver and compounds
2,3,7,8,-Tetrachlorodibenzo-p-dioxin (TCDD)
Tetrachloroethylene
Thallium and compounds
Toluene
Toxaphene
Trichloroethylene
Vinyl Chloride
Zinc and Compounds

DPMC-08875

Substances To Be Identified But Not Controlled

Acetone
N-Alkanes (C10-C30)
Biphenyl
Chlorine
Dialkyl ethers
Dibenzofuran
Diphenyl ether
Methylethyl ketone
Nitrites
Secondary amines
Styrene
Terpenes

ATTACHMENT II

Toxic Pollutant
Regulatory Development Schedule

Activity	Petroleum Refining	Organic Chemicals	Plastics and Synthetics	Miscellaneous Chemicals*
Study Contract Award	9-30-76	12-31-76	6-30-77	10-31-77
Study Contract Completion	9-30-77	12-31-77	6-30-78	10-31-78
Economic Review	12-31-77	3-31-78	9-30-78	1-31-79
Proposed Regulations	9-30-78	12-31-78	3-31-79	6-30-79
Final Regulations	3-31-79	6-30-79	9-30-79	12-31-79
Pretreatment Regulations	2-15-77	-	-	-

*Agricultural Chemicals and Pesticides Not Elsewhere Classified

ATTACHMENT III

Sampling Schedule

Prepare 24 hour composite from
three 8 hour grab sample periods

Biotreater Inlet

3 - 25 ml Vial/8 hours	VOA analysis
1 - qt polyethylene/8 hours	Metals analysis
1 - gallon glass/8 hours	Extraction and NPDES parameters, sulfide, nitrate, Kjeldahl nitrogen, O&G, NH_3, COD, TOC, TDS, total organic chlorides
2 - drums/24 hours	Biotreatment and carbon sorption studies

Treated Effluent*

3 - 25 ml Vial/8 hours	VOA analysis
1 - qt polyethylene/8 hours	Metals analysis
1 - gallon glass/8 hours	Extraction and NPDES parameters + O&G, COD, TOC, TDS, nitrate, NH_3, sulfide, Kjeldahl nitrogen, total organic chlorides
3 - drums/24 hours	Carbon sorption studies and fish toxicity

Biotreater Basin

1 - 100 ml composited from several thief samples taken once during the day, each basin sampled separately	ATP, Dehydrogenase MLVSS; Conductivity Pb & Cr in solids

*Sampled at location used for NPDES sampling

ATTACHMENT IV

Operational Information

Production Units

Production rate, lb/day, capacity
Effluent, gpm

Waste Water Treating

Primary treater

flow rate, gpm
coagulants, type lb/day
pH (after adjustment)

Secondary treater

inlet, flow, gpm (daily avg. & normal schedule)
recycle flow, gpm (daily avg.)
wasting rate, gpm (daily avg.)
effective retention time, hrs.
MLVSS, mg/l; MLSS mg/l
Dissolved oxygen, mg/l
Number of operating aerators
GLC analyses of influent
Temperature

Outfall

flow, gpm (avg. & at sample time)

pH	Pb
TOC	Cr
COD	O&G
BOD	
TSS	

Historical Operations Information

Variability of NPDES Parameters
average, max., min., standard deviation

Miscellaneous Information

Review of toxic pollutant list to identify possible pollutants in effluent

Identification of specific chemicals the the class designations (e.g. diethanol amine might be one of the secondary amines present in the effluent)