ENVIRONMENTAL CONSIDERATIONS IN THE PETROCHEMICAL INDUSTRY

by

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The petrochemical industry, particularly the polymer and plastics industries, has been among the fastest growing sectors of the world's economy. The oil crisis, notwithstanding, a number of countries have shown great interest in establishing or expanding their petrochemical and related industries. The Philippines, in particular, is pushing through with its integrated petrochemical complex starting with the establishments of plants for low density polyethylene (LDPE) and polypropylene (PP).

With the growth of the petrochemical and plastics industries has come the responsibility for disposal of increasing quantities of air and water pollutants and especially solid wastes. One aspect of importance, however, is that plastics, particularly thermoplastics, are recyclable.

Today, some 20 million tons of plastics are used annually in products ranging from automobile components to artificial heart valves. Although the great majority of plastic products are used in applications that require long service, there is a growing use, however, of plastics in short-term applications. This has led to some apprehensions regarding the impact of plastics in solid waste and land pollution.

The plastics industry presents fairly massive problems of air pollution, water pollution, and solid waste disposal. The air pollution problems result from manufacturing processes and to some extent from the burning of plastics and rubber products. The water pollution problems are primarily a product of manufacturing operations. The solid waste disposal problems of the non-biodegradable plastic products are perhaps the greatest problem of the three.

The table below summarizes the type of treatment and technology currently employed and the observed average treated effluent loadings for plants producing various plastics. The effluent loadings are given in kg. per 1000 kg. of finished product.

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*Abstract of lecture presented by Dr. Filemon A. Uriate, Jr., Associate Professor, Department of Chemical Engineering, University of the Philippines on October 17, 1979 during the seminar sponsored by the National Engineering Center in cooperation with EDPITAF.

Product	*Technology*	*BOD_5*	*COD*	*SS*
Acrylic resins	Equalization, Trickling filters, Polishing lagoons	0.70		
Acrylic resins	Neutralization, Equalization, Bio-oxidation (design)	3.1	30.8	
Amino (Urea) resins	No separate treatment facilities encountered. Most plants discharge to municipal systems or are part of a major complex	0.08	0.40	0.16
Amino (Melamine) resins	Equalization, 2-stage bio-oxidation, Clarification, Polish (may be used for amino resins alone)	0.06	0.30	0.12
Cellulose acetate	Equalization, Chem., treatment, Settling, Activated sludge clarification	1.7	14.0	2.8
Cellulose nitrate	Neutralization, Sedimentation, Spray oxidation	3.34	13.7	4.4
Epoxy resins	See amino resins above. (Oil Sep., Neut., Chem., coag., Flotation, Bio-ox., Clarifier may be used for epoxy alone)	0.16	0.80	0.32
Ethylene-vinyl acetate	Skimming, Bio-oxidation	0.07	0.25	0.15
Phenolics	See Amino resins above (Settling, Neut., Chem. coag., Equal., Clarif., Act. carbon may be used for phenolics alone)	0.55	2.8	1.1
Polyesters (unsat) and alkyds	Settling, 4-stages of bio-oxidation	0.09	0.47	0.21
High density polyethylene	Screen, Chemical Treatment, Aeration Pond	0.18	1.0	1.19
Low Density Polyethylene	API Separator, Equalization, Aerobic Lagoon	0.13	0.87	0.26
Polypropylene	Screen, Equalization, Chem. treatment, Activated sludge, Polishing Pond	0.33	0.66	0.57
Polyvinyl acetate	Equalization, Chem. treatment, Activated sludge, Clarification, Polishing Pond	0.08	0.60	0.09
ABS/SAN	Equalization, Activated sludge, Aerobic sludge, Clarification	0.184	1.83	0.52
Polyvinyl butyral	Equalization, Activated sludge	2.6	13.6	6.5
Polyvinyl chloride	Equalization, Chemical treatment, Settling, Activated sludge, Clarification	0.14	1.0	0.80
Silicones				
Multiproduct	Neutralization, Bio-oxidation	8.6	46.0	25.0
Fluid product	Neutralization, Sedimentation, Skimming, Filtration	1.1	—	1.1