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Pollutants Removal and Safe Discharge in Environment

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Editorial Note

Inorganic pollutants include alkalis, mineral acids, inorganic salts, free chlorine, ammonia, hydrogen sulphide, salts of chromium, nickel, zinc, cadmium, copper, silver, etc., anions such as phosphates, sulphates, chlorides, nitrites and nitrates, cyanides; cautions such as calcium, magnesium, sodium, potassium, iron, manganese, mercury, arsenic, etc.

Organic pollutants include high molecular weight compounds such as sugars, oils and fats, proteins, hydrocarbons, phenols, detergents, and organic acids. Some of these pollutants are resistant to biodegradation and others are toxic to aquatic life in the receiving water. Their removal, or at least reduction to a low concentration, becomes necessary in order to be able to treat such waste water by biological means.

In addition, industrial wastes may contain radioactive material, which need very careful handling, treatment and disposal.

The characteristics of industrial wastes, which are combined with domestic sewage generated within the factory premises, are somewhat different from those of the industrial waste alone, on account of dilution offered by the sewage. Further, such mixtures are easier to treat biologically because of the presence of microorganisms in the sewage. If the industrial waste is deficient in nutrients such as nitrogen and phosphorus, these elements are supplied to some extent by sewage, leading to economy in the consumption of chemicals, e.g. urea and DAP which are commonly used for nutrient supplementation. An added benefit in such a case is that a common treatment plant to be designed for treating both, industrial wastes and sewage.

The aim of the treatment is to remove pollutants from the waste water and render it fit for safe discharge to the environment. In view of the increasing demand for water, and its decreasing availability, mere 'end-of-pipe' treatment is not the answer to pollution control. Reuse, recycling and where feasible, by product recovery must become an integral part of the treatment scheme. Experience shows that is possible to achieve this goal without incurring heavy expenditure. In many cases, the practice of reuse, recycling and by product recovery has resulted is not only meeting the operating costs, but also offering an attractive payback period to the industry. Some examples of successful reuse and recovery are given. Methods of treating waste water can be classified as follows.

Physical methods include screening, sedimentation, flotation, filtration, mixing, drying, incineration, freezing, dialysis, osmosis, adsorption, gas transfer, elutriation, etc. Chemical methods include pH correction, coagulation, softening, ion exchange, oxidation, reduction, disinfection. Biological methods employ aerobic, facultative and anaerobic microorganisms to destroy organic matter and reduce the oxygen demand of the waste water. A combination of the above three methods is also used to treat waste water.

Adequate treatment can also be obtained by selecting one or more of the physical, chemical and biological units and arranging them in a logical sequence, so that the effluent of one unit suitable as influent to the next unit. Selection and sizing of the proper units is done by flow measurement, sample collection and characterization of the waste water flows, subjecting the waste water samples to treatability studies by employing laboratory scale models, which may be run on a batch feed basis, semi continuous feed basis, or continuous basis, deciding which combination of unit operations and unit processes will be appropriate for the waste water under study, and if necessary, running a a pilot plant, which will simulate the working conditions in a full-scale plant.