

Wastewater Management Solutions Benefit Indian Oil Corporation

By Sambuddha Sengupta



The importance of water preservation is now well-known to the global population. Due to the highly exhaustive nature of this critical natural resource, economies around the world have put particular focus on the preservation and re-utilization of water. Wastewater treatment can simply be regarded as a part of this effort.

The estimated figure for India's overall exploitable renewable fresh water resources stands at 1100-1200 billion cubic meters. Even as the total water resource availability remains constant, the demand for water has grown significantly. This is largely due to the steady rise in population, increasing urbanization leading to changing

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Figure 1 (Image courtesy - ppec.co.in)

lifestyle, and a stable economic growth. This increasing demand has made it necessary for the Indian government to think about ways to preserve and re-use this valuable natural resource.

Wastewater treatment can well be seen as a part of this attempt to recycle water. Several companies have been doing pretty well in this direction. Let us look at a specific case to understand how a company managed to excel in its endeavor in this direction.

Hindustan Dorr-Oliver Limited (HDO)

Considered to be one of the leaders in the Engineering, Procurement and Construction (EPC) market, HDO has been involved in multiple projects in areas like water and wastewater management. One such project that the company handled and executed successfully was for the Indian Oil Corporation Limited (IOCL). www.netscribes.com

The Task

In 1995, HDO was given the task of setting up a 14.4 MLD Wastewater Treatment Plant at the IOCL Panipat refinery in Haryana. The entire EPC

contract was given to HDO on a turnkey basis. IOCL being one of the largest group refineries in the country, the issue of environmental protection became optimally important for them. The decision to set up a 600 m³/hr (14.4 MLD) plant was taken as a response to the demand of environmental authorities for zero discharge.

The techniques used at the plant for wastewater treatment were:

- ▶▶ Tilted Plate Interceptor
- ▶▶ Bio-Tower
- ▶▶ Dissolved Air Floatation
- ▶▶ Aeration
- ▶▶ Clarifier
- ▶▶ Pressure Sand Filter
- ▶▶ Filtration
- ▶▶ Gravity Thickener
- ▶▶ Centrifuge

Tilted Plate Interceptor: This process is used to separate free oil from

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Figure 2 (Image courtesy - www.siemens.com)

effluent water in an oily water system. The basic principle used in this process is the difference in gravity between the phases (liquid-liquid or solid-liquid). The phenomenon can be more appropriately defined as 'Gravity Separation'. The mechanization used in this process clearly shows that the phase with high density will settle while the one with low density will float on the surface of the fluid. Chemical coagulation and flocculation are also needed in the process to remove impurity by making them either heavier or lighter.

HDO used this process to separate oil from water. Even though the success of the project depended on various factors like density, medium, temperature, viscosity, turbulence and even the nature of impurity, HDO was able to successfully employ this process for the Panipat plant.

Bio-Tower: Use of biological processes is pretty common in wastewater management. They are usually used to reduce the Biochemical Oxygen

Demand and in a few cases, the ammoniacal nitrogen concentration of the effluent.

The term bio-tower is basically used to refer to a housing in which wastewater pours in through a bed of slime covered media and is treated by micro-organisms present in the slime layer, using the contents of wastewater as a source of food for the micro-organisms. HDO was able to successfully treat wastewater with the help of bio-tower in the IOCL plant.

Dissolved Air Floatation: Being an oil refinery, IOCL's key challenge was deploying techniques to separate oil from water. Therefore, dissolved air floatation was selected as a method.

In this process, the suspended matters such as oil or solid wastes are separated from water. This is achieved by dissolving air in the water under pressure. Later, the air is released at the atmospheric pressure in a flotation tank or basin. The released air forms tiny bubbles that cling on to the suspended matter, causing it to float on the surface of the water. From there it could easily be moved with the help of a skimming device.

Aeration: This is a commonly used process wherein air is circulated through, dissolved or mixed with the liquid substance. This may involve processes like passing the liquid through air by means of fountains or cascades or passing air through liquid with the help of venture tube, aeration turbines or compressed air which can then be combined with diffuser, air stone, etc.

Clarifier: It includes a rack of inclined metal plates that cause the flocculated material to precipitate from the water that flows across the plates. This process was widely used in the Panipat plant to treat water and separate solids from the liquids.

Even though the clarifiers are designed in a variety of shapes, but such large water treatment plants use large circular open-air tanks. When wastewater enters these facilities, the flow slows down significantly, thereby allowing the suspended solids to settle down on the floor. The settled solids are then directed towards the center using collection scrapers.

Pressure Sand Filter: There are basically three types of sand filters:

- ▶▶ Up-flow sand filters
- ▶▶ Rapid sand filters
- ▶▶ Slow sand filters

While Up-flow sand filters and Rapid sand filters require the use of flocculent chemicals in order to work properly, slow sand filters have the ability of producing high quality water which is free from pathogens, taste and odor, even without the use of chemical aids. This technique is highly recommended for the removal of suspended solids and undissolved impurities in the water, such as dust particles and heavy metal.

Filtration: This is another commonly used technique opted by HDO for separating solids from liquids by interposing a medium that allows only fluids to pass. The medium used as filter can be constituted of paper, cloth, cotton-wool, asbestos, unglazed earthenware, etc. This is one of the most frequently used techniques in wastewater treatment. With help of this process, particles and fluid are separated from the suspension.

Gravity Thickener: By this process, water is removed from the sludge in order to achieve a reduction in moisture content while the solids are thickened. Flocculation and coalescence are the two processes used to accelerate the rate of settling. Thickening wastewater solids help to reduce the volume of residuals and improving operation. HDO being one of the leaders in employing this process in the country, it executed the technique quite successfully.

Centrifuge: This equipment puts the wastewater in rotation around an axis, applying perpendicular force to the axis. It is highly effective while dewatering solids and deriving fresh water.

The Panipat refinery was HDO's first turnkey refinery ETP project. What was special about the project is that it was the first time that the company installed Archimedean screw pumps for wastewater treatment. These pumps are well-known for qualities like simple and rugged design, high efficiency and their ability to pump raw water even if it contains huge amount of solids and debris. They are also known for their lifetime reliability.

Being the first water and wastewater treatment firm in India, the road towards success was never easy. However, with the successful completion of many such projects involving well-known brands like Bharat Oman Refineries Ltd (9-MLD Effluent Treatment Plant), Bharat Petroleum Corporation Ltd (3-MLD Effluent Treatment Plant) and Tata Chemicals (950 m³/hour pre-treatment plant), HDO has established itself as a leader in wastewater treatment services in India.

About the Author

Sambuddha Sengupta works with Netscribes, specializes in content development and planning.

Netscribes is a knowledge consulting and solutions firm with clientele across the globe. The company's expertise spans areas of investment & business research, business & corporate intelligence, publishing services and customized knowledge database creation. At its core lies a true value proposition that draws upon a vast knowledge base. With over 13 years of experience in the information and research space, 250+ full-time analysts on its rolls and more than 7,000 research projects under its belt, Netscribes has worked for several Fortune 500 corporations and financial intermediaries across the globe.

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