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OSI ENVIRONMENTAL

Solving waste oil management and removal problems in power generating plants

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If your plant is like most, it is doing a good job of preventing oily water waste and waste oils from escaping into the environment. But at what cost? As labor resources dwindle, operating and maintaining drainage systems, oil separators, and sometimes inadequate oil removal equipment is expensive. Paying higher than needed costs for waste oil disposal, filtration and water treatment due to these limitations is unacceptable. How can you solve waste oil management and removal problems without breaking the budget? Read on.

Problem 1: A little oil = a big cleanup

Petroleum-based products, ranging from fuel oil and hydraulic fluid to lubricating greases and oils, are found throughout every type of power generating plant or system -- coal-fired, gas-fired, hydroelectric, and nuclear. Lubrication supports bearings and moving parts in all sorts of equipment: pumps, conveyors, feeders, scrubbers, cranes, turbines, and more.

Given the hundreds of lubricant connections, bearing and hydraulic seals, and other moving components in a plant, it is inevitable that some oils will escape, finding their way into the process, cooling, or cleaning water that flows throughout a plant. Hydroelectric plants face a uniquely difficult challenge, since the high-pressure process water needed to contact and drive turbine components also tends to strip away essential lubrication. Typically, this oily or greasy water flows to:

- the outflow collection point of a recirculating cooling system,
- the outflow collection point of a once-through cooling system,
- the outflow collection point prior to the waste treatment facility, or
- drainage sumps or pits deep within the plant.

At any of these points, oil separation and removal is the logical first step in the water treatment process--the first step in conditioning water for recirculation, for discharge into a local waterway, or for discharge into a local sewer system. With optimal oil separation and removal practices, it is likely that you can cut costs for labor and maintenance, waste oil disposal, and secondary water treatment including filtration and chemicals. But how?

Problem 2: Separating a little oil from a lot of water

A good oil/water separation system will result in a flow of concentrated waste oil to a collection area and a flow of oil-free water ready for secondary processing or discharge. There is a lot of equipment available to help with this process, but there are some pitfalls as well.

Stokes' Law tells us that, given the differences between the specific gravity of oil and water, separating these two liquids is really a matter of flow rate, oil droplet size and surface area. Thus, a sump, pit or pond with sufficient surface area and a sufficient amount of time can separate oil and water very effectively. However, few plants have the space or capacity to hold large volumes of oily water for long.

To speed up this process, prefabricated grease/oil interceptors or separators are often built into drainage systems deep within plants or just outside. These separators use a variety of methods — usually baffles, plates, or tubes — to "increase the surface area" that comes into contact with the oily water. The increased contact

maximizes the number of small oil droplets that will agglomerate and rise to the surface in a given period of time. These form a layer of waste oil, ready for removal. Below the oil is a layer of clean water, which flows under a baffle on its way to additional processing or discharge.

Maintenance is essential to ensure continuous removal of the accumulated waste oil layer, either from the separators themselves or the drainage sumps that feed them. If waste oil is not removed from these vessels regularly, a series of problems can occur as the waste oil layer builds up:

- A heavy inflow of water, such as rainfall, can exceed the vessel's design capacity, resulting in washout of the waste oil.
- The area within the separation chamber is reduced.
- The oil layer prevents oxygen from reaching the surface of the water, resulting in the growth of anaerobic bacteria that plug separator plates and emit foul odors.
- Dirt and debris collect rapidly on the oil layer, combining with waste oil to form a heavy sludge. This sludge can sink in a short period of time, spread to adjacent pipes, pumps and flow controls and disrupt the operation of monitors and sensors.

Problem 3: Removing a layer of oil, without adding a layer of expense.

Once an oil layer has been separated from free water, it must be removed for recycling or disposal. Many plants use one or more of these oil removal methods, but each has costly limitations:

Absorbent materials. Absorbent mats or materials are frequently used to dam up and absorb excess oils and greases resulting from accidents or the routine operation of machinery. These materials are very effective for preventing the spread of a source leak and very efficient in terms of oil pickup. Yet, their use on large volumes of waste oil results in multiple, recurring costs that can make them impractical as an everyday solution:

- the costs of the materials themselves
- the labor costs for ordering, stocking, application, and removal
- the costs of used-media collection, disposal, or re-processing/recycling.

Manually operated "slotted pipes." Many separators feature a "slotted pipe," a pipe located near the top of the vessel that has a horizontal opening. Oil is removed by turning the horizontal opening downward until it meets the floating oil layer, which drains through the pipe to a collection receptacle. These pipes work well on thick layers of oil, but cannot drain off a sheen of oil without draining off a large amount of water as well.

Vacuum truck removal. Vacuum-equipped tank trucks are used to remove waste oil from collection points at plants so that it can be transported to recycling or disposal locations. If the waste oil has been thoroughly separated, highly concentrated, and stored in an appropriate receptacle, this service can be used very efficiently. However, vacuum disposal units are often used to pump oil layers directly off of water. This results in the intake of a significant amount free water along with the waste oil – and a significantly higher cost to your plant.

Solution: Automatic oil skimming removes the oil, and the expense

The best option for oil removal, automatic oil skimming, complements or replaces the other methods, while improving process efficiency and reducing costs. Available in a wide range of designs and sizes, skimmers offer versatility and efficiency, cut labor and maintenance requirements, and reduce disposal requirements. Skimmers are versatile because they can remove oil from any water holding areas including separators, sumps, ponds, lagoons, cooling towers, and more. Thanks to automatic operation, they remove oil with efficiency that equals or exceeds the best of the other methods, yet with far lower labor costs. And, they reduce disposal costs because they capture and concentrate waste oil with little or no free water.

While a wide range of skimming equipment is available, experience demonstrates that the maintenance needs of power plants require skimmers with these essential characteristics and capabilities:

1) **Vertical lift.** An oil skimmer must be able to reach the oily water where oil removal is needed. Drainage pits or sumps may be located up to 100 feet deep in the structure of a plant, making them difficult to access for inspection or for set-up, adjustment, or maintenance of skimming equipment. An oil skimmer with vertical lift capability can eliminate or greatly reduce all of these problems.

2) **Ability to cope with water level fluctuations.** Within a pit or sump, oily water levels can fluctuate widely, making it difficult or impossible to apply and remove absorbent media, or to access and operate a slotted pipe, for example.

3) **Ability to cope with varied oil amounts and concentrations.** Any skimmer can remove a thick layer of oil without drawing in free water, but how well do skimmers handle a thin sheen of oil? Weir and floating-type skimmers work according to slight differences in depth. They may either leave the sheen behind because they are adjusted too high to collect a thin sheen, or draw in significant amounts of free water because they are adjusted too low. Belt skimmers and floating tube skimmers collect oil by attraction, not relative depth, so they are better at removing a light sheen of oil.

4) **Ability to cope with debris.** Skimmers vary in their ability to remove oil from water where debris is present—a common circumstance in power plant drainage systems. The operation of fixed-position belt skimmers, or floating skimmers that have fixed inlets, can be disrupted if debris collects around them and limits access to floating oil. However, the movement of a floating tube skimmer eliminates this potential problem since it continuously snakes around the surface and moves debris out of the way.

Summary

If your plant faces challenges with oily water management and oil removal, consider the cost saving benefits of an oil skimmer. As we have noted here, the right oil skimmer can:

- Complement or eliminate other forms of oil removal.
- Reduce labor costs associated with managing oily wastes.
- Simplify or reduce the maintenance involved with drainage systems and oil separation equipment.
- Easily be moved from location to location (sump to sump), so that a single unit can serve several areas that require infrequent skimming.
- Remove oil continually, unattended.
- Reduce the costs of filtration, chemicals, and other forms of secondary water treatment associated with residual oily water,
- Increase the concentration of waste oil and thereby reduce the total volume and cost of vacuum collection and off-site recycling or disposal.
- Provide a versatile and effective backup system for oily water management in the event of flooding, spills, or in-plant accidents.

Do you need automatic oil skimming? Consider:

- Has your plant had any past problems with oily water releases?
- Is an oily sheen visible in any water that circulates in your plant? In any water that leaves your plant?
- Is the lack of labor resources preventing the timely removal of oil accumulations in sumps, pits or separators?
- Has the buildup of sludge forced you to undertake expensive drainage and cleaning of sumps, pits, separators, or monitoring equipment?
- Is your plant's cost for vacuum waste disposal higher than required due to the presence of free water in the waste stream?
- Does your plant pay high costs for secondary water treatment due to the presence of oil residues?
- Could a lubrication system failure or lubrication spill overwhelm your current plant systems and result in a discharge of oil to the environment?

Have questions about automatic oil skimming equipment options? Give us a call.

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