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Lubrication of Pumps at Wastewater Treatment Plants

In a typical wastewater treatment plant process, the unit group of electric motor, gear reducer, coupling, and then pump, blower, etc. is repeated over and over, with minor differences incorporating couplings and chain or belt drives. Pumps with various configurations are interspersed throughout the plant with minor differences including the coupling and belt or chain drives.

Pumps may be rotary, piston or turbine type and are usually grease-lubricated, except for the turbine types, which are generally drip-oil-lubricated at the lower bearings and greased at the top. In general, a top-quality multipurpose extreme pressure (EP) grease should be used for its sealing ability and its resistance to impact and wear. An anti-wear, rust and oxidation (R&O) turbine oil should be used.

Beginning with the wastewater collection systems and lift stations, pumps are used in large, sophisticated systems where the topography will not allow for gravity flow. When pumps are used in the collection systems, including those at the lift stations, the sewer line becomes a force main. Pumps play a substantial part in the collection system, which in turn represents a large portion of the investment in a sewage system. For that reason, modern sewer systems incorporate the installation of adequate pumping facilities. Savings in construction costs can be realized by using more pumping stations.

In addition to electric motors or standby internal combustion engines, many pumps and valves are involved in the collection system lift stations as well as throughout the wastewater treatment plant.

Types of Pumps

Pumps used at wastewater treatment plants are many and varied, including those listed below.

Vertical Pumps

Fluid-Handling Pumps

- **Centrifugal pumps** may be mounted with a horizontal or vertical drive shaft. These are readily accessible for cleaning or repair, and involve a minimum of maintenance expense largely because of only one moving part: the impeller. This type of pump will easily handle sludge as well as normal sewage solids.
- **Axial flow (propeller) pumps** require the main shaft bearings to be located in the waterway, usually in the hub of the diffusion vanes. These are recommended for limited spaces, and for economy.
- **Mixed-flow pumps** offer definite advantage for plants operating at a high load factor, and for wastewater containing trash and other solid materials.
- **Screw pumps** can be used for pumping raw wastewater, sludge or slurries, and they have the advantage of less excavation, no need for suction piping, constant operating efficiency and nonclogging operation.

- **Pneumatic injector (ejector) pumps** have the advantage of few or no moving parts in contact with sewage. Such pumps are particularly favored by hotels, office buildings, institutions and industrial plants where the basement is below the sewer lines. Injector pumps are also used for sewage lift stations. They require no sump and are flushed at every cycle.
- **Submersible pumps** are used in sumps, bilges or wet wells. They have totally enclosed, permanently lubricated electric motors, such that the pump and motor can operate below the liquid level. A typical submersible pump is a vertical pump with enclosed shaft and vertical discharge pipe. They may also be called sump pumps or bilge pumps.

Sludge-Handling Pumps

Pumps used for handling sludge should be those specifically designed for that purpose. Sludge is still a fluid and obeys the laws of hydraulics, but it contains up to 10 percent solids. The conditions under which it is pumped differentiate from fluid sewage.

- **Reciprocating pumps**, whether plunger or diaphragm, operate with good efficiency at a wide range of speeds and are especially suitable for handling sludge.
    - **Plunger pumps** offer easy accessibility of the valves for quickly removing obstructions or replacing the ball or flap valve.
    - By substituting a flexible diaphragm for the piston head, a reciprocating or positive displacement pump becomes a **diaphragm pump**. Then, it can be air-actuated or driven by an internal combustion engine or electric motor.
- **Rotary pumps** of the progressing cavity design, similar in operation to a screw conveyor, will handle sludge as well as viscous fluids. By opening up the impeller of a centrifugal pump, a solids-handling pump is feasible for most domestic waste sludge. An important feature is easy access to the impeller through a removable cover plate.

Lubricant Recommendations

The number and types of pumps installed at any wastewater treatment facility will depend largely on the plant's capacity and its range of treatment. Typical lubrication recommendations for various sewage, sump, sludge, slurry, scum, seal water, circulating and chemical feed pumps follow. However, we advise you to consult your *OEM Lubrication Guide* or LE's Technical Services Department for the most accurate product recommendations.

Motors & Pumps

Oiled Bearings

- Monolec® R & O Compressor / Turbine Oil (6403-6405)
- Multilec® Industrial Oil (6803-6805)
- Duolec® Vari-Purpose Gear Lubricant (1602)

Greased Bearings

- Monolec® Industrial Lubricant (4701)
- Almaplex® Industrial Lubricant (1274-1275)
- Almagard® Vari-Purpose Lubricant (3751-3752)
- Almatek® General Purpose Lubricant (1232)
- Monolec® Multiplex Lubricant (4622)

Gear Reducers

- Monolec® R & O Compressor / Turbine Oil (6403-6407)
- Multilec® Industrial Oil (6803-6807)
- Duolec® Vari-Purpose Gear Lubricants (1602, 1605, 1607)

Couplings

- Monolec® Industrial Lubricant (4701)
- Almaplex® Industrial Lubricant (1274-1275)
- Almagard® Vari-Purpose Lubricant (3751-3752)
- Almaplex® Ultra-Syn Lubricant (1299)

Pump Packing Glands

- Almagard® Vari-Purpose Lubricant (3751-3752)

Gear Reducers

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