IWAKI PUMPS
Simply more reliable

Chemicals requiring caution

The following information is provided based on experience gained by IWAKI.
Some details may change depending on the nature of the fluid and the pump operating conditions.
For information relating to the handling of various chemicals, refer to the MSDS issued by the manufacturer of the chemical.

High-viscosity fluids

Sodium hydroxide, sulfuric acid, etc.

• Viscosity limit :

The pump head and flow rate reduce as the viscosity of the fluid increases, accompanied by a reduction in pumping efficiency. In addition, the amount of internal circulation within the pump itself tends to decrease. Consequently, the pumping of extremely high viscosity fluids may cause overheating of the bearings and potentially a risk of poor lubrication.

To counter this problem, Iwaki imposes a limit on viscosity of 120 mPa·s on fluids in magnetic drive pumps. Please contact IWAKI for more information about the handling of higher viscosity fluids.

• Precautions against fluid temperature drop :

In general, the viscosity of a fluid increases as the temperature drops. The fluid viscosity increases as the temperature of the fluid drops after stopping pumping and as the ambient temperature drops. This may result in a higher required shaft power than originally planned when pumping resumes, and the required flow rate may not be achievable.

Accordingly, a sufficient motor power margin should be maintained to cover this scenario.

A normal motor power margin of 10% is recommended. However, if there is an expectation of the kind of viscosity problem mentioned above, it is recommended that a margin greater than 10% be maintained.

• Precautions for air venting operation :

During operation, you can release any air trapped in the pipes and inside the pump using a relief valve. However, separation of fluid and gas is more difficult in high-viscosity fluids, compared to water, meaning that some residual air may be left the pump after relieving. In such cases, venting of air must be conducted more frequently.

Specifically, increasing the number of inching motions and the flow rate are effective.

If the planned flow rate is relatively low, the flow rate will tend to drop even further when venting air, so maintaining a sufficient motor power margin and venting at as high a flow rate as possible is recommended for the effective release of trapped air.

Fluids with high electrical-insulating properties

Ultra-pure water, inert fluids, etc.

Fluoroplastics used for wet ends in the pump have high insulation properties. When handling fluids with high-insulation properties, friction between the fluid and fluorocarbon polymer materials can cause a build-up of static electricity within the pump.

If an excessive electrostatic charge accumulates, an electrical discharge (spark) may occur within the pump that can damage components. Accordingly, anti-static measures are recommended.

Note that models for handling ultra-pure water are also available by custom order. For more information, contact IWAKI.

Fluids containing slurry

Silica, iron powder, etc.

As a rule of thumb, the maximum limits on slurry permitted in a magnetic pump are 5 wt% density, 50 µm particle size, and 80 Hs hardness. However, magnetic pumps are basically unsuitable for the handling of fluids that contain slurry.
Slurry not only leads to increased wear of pump components, but can also accumulate in the clearances of the bearing and spindle, potentially causing poor lubrication.
In addition, the pump may become damaged, depending on the properties of the slurry and the operating conditions. Testing under actual conditions are essential.
Observe the following points if pumping fluid containing slurry.

- Select SiC material for bearings

SiC (KK type) is a very hard material that prevents wear of the bearings. Carbon (CF type) wears more easily, compared to SiC, and its use should be avoided.

- Prevent slurry in the supply tank

Damage to the pump can be greatly reduced by preventing slurry in the supply tank. The risk of slurry deposits entering the pump is further reduced by placing the suction pipe inlet some distance off the bottom of the supply tank.
If possible, however, avoid placing a filter in the suction pipe. A clogged filter can cause cavitation and other trouble in the pump.

Foaming fluids

Hydrogen peroxide, sodium hypochlorite, etc.

If the amount of gas bubbles created during pumping is relatively small, any affect on pump performance may safely be ignored. However, if a large volume of gas bubbles enters the pump, not only will there be a drop in pump performance, but there is also a risk that it may lead to poor lubrication of the bearing.
In addition, any air bubbles generated may accumulate in the suction pipe when the pump stops and that air may flow into the pump all at once when the pump is restarted, potentially causing a vapor lock condition. Accordingly, air venting is required each time before starting the pump when handling fluids that contain or generate large quantities of gas bubbles. Adding a gas relief pipe on the discharge side is required and adding a gradient to the suction pipe to help release trapped gas is also effective.

Fluids that crystallize easily

High salt concentration, etc.

In handling fluids prone to crystallization, management of liquid temperature and concentration will be required to ensure the fluid is not in an oversaturated state. Any crystal material generated from a fluid in an oversaturated state may adhere to and accumulate in the clearances of the pump wet ends, leading to the pump sticking or seizing.

Fluids with high permeability

Nitric acid, hydrofluoric acid, Halogenized hydrocarbon solvents, etc.

Fluoroplastics used in process magnetic pumps have a very high corrosion resistance compared to metallic materials. On the other hand, plastics are also materials where the permeation of chemicals is inevitable.
In particular, when handling nitric acid, hydrofluoric acid, hydrocarbon solvents, and other fluids with a high permeability at high temperatures, the affects of permeability must be considered.
The following typical affects of permeability may occur:

- Corrosion of metallic components due to chemical permeation
- Blistering of plastic due to chemical permeation

In both cases, pump trouble will not occur in the short term, but will manifest itself gradually, depending on the duration and conditions of use.
If handling chemicals with high permeability, inspect the interior of the pump regularly (every 3 to 6 months) in order to determine the condition of pump component.

Halogenated chemicals

Halogenated hydrocarbon chemicals are chemicals with high permeability and at the same time are corrosive to fluorocarbon polymers at high temperatures. In addition, hydrocarbon-based chemicals have a high saturated vapor pressure, making the pumping of such fluids highly susceptible to cavitation. Therefore, pump liquid ends made from plastics are not suitable.

Fluids containing corrosive gases

Free chlorine, ozone, etc.

Magnetic pumps are designed for pumping fluids, and are unsuitable for pumping fluids containing large volumes of gas. In particular, the handling of fluids containing corrosive gases can adversely affect the pump.
For example, the circulation of sulfuric acid in chlorine gas drying towers and other fluids that produce chlorine gas pose a corrosion risk to carbon materials. Always select SIC (KK type) material for bearings.

Fluids that attack fluorocarbon polymers

Fluorocarbon polymer materials have excellent chemical resistance in general, but there are some exceptions (below) that do attack fluorocarbon polymers.

If the wet end material is PFA :

- High-concentration hydrofluoric acid (HF) at more than 100°C
- Strong oxidizing agents at high temperature such as Chlorine trifluoride (ClF_3), bromine trifluoride (BrF_3), iodine pentafluoride (IF_5)

If the wet end material is ETFE :

- Chemicals above that cannot be handled with PFA
- Halogenated organic compounds such as Chloroform (CHCl3), Perchloroethylene (C2Cl4)

Plating solutions

Gold plating, chrome plating, etc.

In so-called water gilding, a electric potential difference is applied to a product in a plating bath to create a surface film, but here it refers to components of plating solutions deposited on the inside of the pump.
As the deposits increase, friction loss of sliding components increases and may eventually lead bearings seizing. The level of deposit formation depends on the type, temperature, and concentration of the plating solution, so evaluation of the working life of the pump based on past history and actual operation is required when selecting a pump.
In electroless nickel plating, more deposits in the pump can also be expected. For more information, contact IWAKI.

Low-temperature fluids

Antifreeze, etc.

If handling low-temperature fluids such as antifreeze, precautions are required to guard against the formation of condensation and frost. In particular, any frost that adheres to the rear casing may come into contact with and damage the drive magnet.
Covering the surface of the pump with thermal insulation material and reducing the temperature difference with outside air are effective.

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