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"Environmentally Safe Fluid for Hydraulics Used in Civil Engrg"

ENVIRONMENTALLY SAFE FLUIDS FOR HYDRAULICS USED IN CIVIL ENGINEERING

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ENVIRONMENTALLY SAFE FLUIDS FOR HYDRAULICS USED IN CIVIL ENGINEERING

The majority of hydraulic units used in civil engineering are operated with pressure fluids based on mineral oil. Most civil engineering projects are installed near or immediately next to bodies of water, therefore, any leakage signifies danger for the environment.

We try to avert this danger with increasingly safe hydraulic drives. However, growing environmental awareness and stricter laws are demanding more and more environmentally safe hydraulic fluids.

Today, the manufacturers of fluids and hydraulic drives have to accept this challenge.

What exactly is an environmentally safe hydraulic fluid?

The major objectives are:

- they have to be bio-degradable
- no fish toxicity
- no bacterial toxicity
- no water pollution and
- food compatibility

To summarize:

Humans, animals, plants, water, air and ground must be safe

Unfortunately, there have been neither law nor standards which clearly define the attribute "environmentally safe" hydraulic fluids, and there are no directions about what to do in case of an accident, such as leakage of large quantities of these fluids.

If there are accidents, the same guidelines apply as with mineral oil because even environmentally safe fluids have to be handled carefully and they cannot be left behind in the environment after they have leaked. However, ground cleanup will be much cheaper than with mineral oil.

The following environmentally safe hydraulic oils are presently available in the market:

1. Native base oils
2. Synthetic base oils

1. The native base oils can be separated into plant oil (rape seed oil) and oleic acid esters. Both plant oil (rape seed oil) and oleic acid esters are hardly suitable for civil engineering applications because both fluids show inferior characteristics with low temperatures. They can be used in areas only where the temperature does not drop below +10 degree C (approximately 50 degrees F).

   Another disadvantage is the short life span of these fluids. The fluid should definitely be changed once a year even if the 1000 operating hours have not been reached. This short life span is due to the fluids' inferior compatibility with water.

2. The group of synthetic base oils is divided into:

   a) poly-glycols

   b) synthetic esters

Poly-glycols

Poly-glycols are used because of their excellent water solubility, particularly in units located close to open bodies of water.

Glycols are resistant to aging and they react well with low temperatures. Poly-glycols are bio-degradable.

Their major disadvantages are:

- cannot be mixed with mineral oil (might result in deposits of solid particles)

- standard paint coats are corroded and partially dissolved

- various plastic materials and sealing materials are corroded

Synthetic esters

Depending on the choice of acids and the alcohol of the esterifying procedures and the additives added the physical and chemical characteristics of the end products may differ widely.

The aging characteristics and reaction to low temperatures are good. The water content has to be kept as low as possible in order to prevent splitting of the esters through hydrolysis.

Synthetic esters cannot be mixed with water, however, they are highly bio-degradable. Synthetic esters also corrode standard paint coats and also some standard sealing materials.