

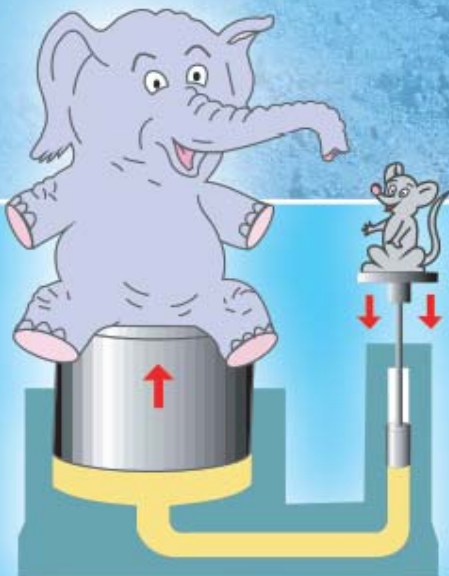
## Hydraulic systems & their lubrication

Hydraulics is a method of transferring power by means of a fluid. The term means "water pipe". Today, hydraulic power transmission equipment forms an essential part of most industrial operations, as well as playing an important role in many pieces of automotive equipment. (e.g. hydraulics forms the basis of the braking system. Power generated by your leg is transferred via a fluid into enough mechanical power to stop your car).

The fundamental reasons why hydraulic systems work are due to three properties of liquids:

- Liquids can assume any shape
- Liquids are almost incompressible
- Liquids transmit pressure equally in all directions.

Because of these three properties, liquids can be used to change small forces into very large forces.

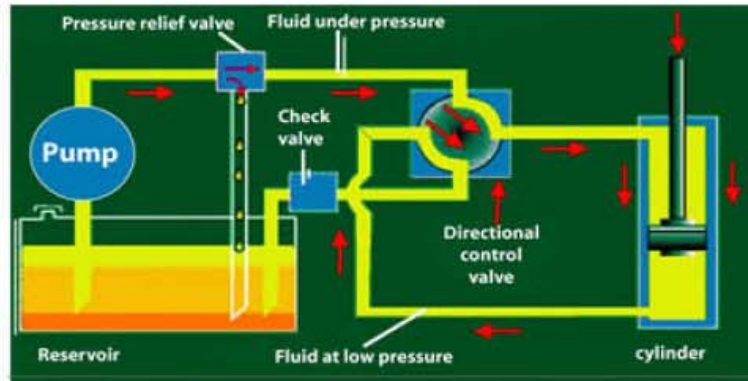


### A basic hydraulic system consists of two parts:

- A pump – to generate a force by moving a fluid. Just as the heart pumps blood around the body, the pump forms the heart of the hydraulic system.
- An actuator – are usually called "cylinders" if their direction of motion is in a straight line. The actuator performs the work. It is the "arms" of the hydraulic system. They are called "hydraulic motors" when rotary motion is involved. Hydraulic motors are just hydraulic pumps working in reverse.
- Check Valve – Valves are the controls of the hydraulic system
- A Reservoir – This fluid is stored in a container called a reservoir.



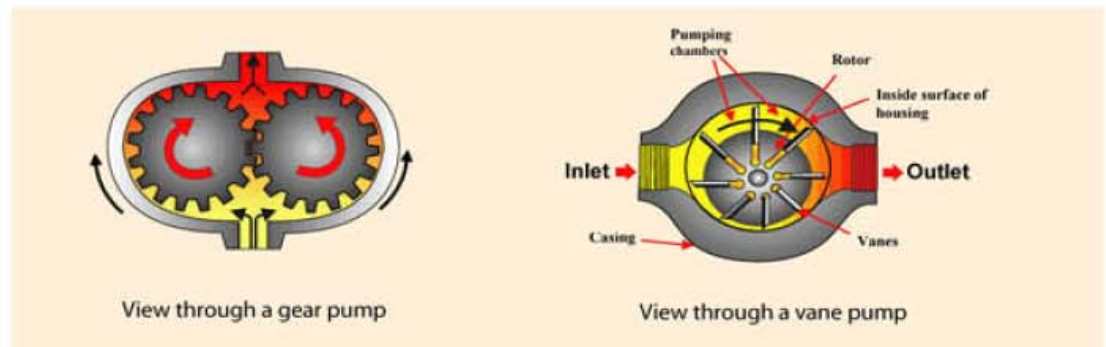
## Diagram of a basic hydraulic system



When it comes to transmitting power, there are many choices available. These choices include mechanical (e.g., motor/engine plus gears, shafts or cables) and electric power transmission.

## Hydraulic Pumps:

Almost all hydraulic systems use pumps powered by electric motors, or maybe by internal combustion engines. The pump is the most critical part of the hydraulic system as far as its lubrication requirements. Therefore, it is the pump that determines the type of hydraulic fluid to be used in the system.



The most common types of hydraulic pumps are:

gear pumps, vane pumps, and piston pumps.

Each of these pumps is different in the pressure that they generate, the anti-wear requirements of the pump, and their tolerance for contamination in the hydraulic fluid.

The most common hydraulic pump is the gear pump - moderate pressures. Gear pumps contain spur gears which are relatively simple to lubricate. They need only minimal anti-wear protection; And least sensitive to contamination, such as dirt, in the hydraulic fluid.

Vane pumps operate with vanes rotating inside the pump housing are capable of generating moderate to high pressures. Hydraulic pressure and centrifugal force produce very high forces holding the tips of the vanes against the pump housing. These forces result in boundary lubrication conditions (metal-to-metal contact) between the vane tips and the pump housing, and anti-wear protection is essential. Vane pumps are also very sensitive to contamination. Even small amounts of hard, abrasive contaminants, such as dirt, causes high wear rates.

Axial piston pumps are very complex in design, but are capable of generating very high pressures. Despite the high pressures they develop, the design of these pumps is such that fluid films are maintained between the pump's components and anti wear protection is not so critical. However, this type of pump is very sensitive to contamination in the hydraulic fluid. It has a very low tolerance for dirt.

## Why use hydraulics

There are many industrial power transmission options, such as mechanical (e.g., motor/engine plus gears, shafts or cables) and electric power transmission.

### Hydraulics is often chosen because:

- Simple, with few moving parts,
- Self lubricating,
- Flexible, hydraulic lines can run for relatively long distances, and be directed to suit other equipment needs,
- Multiplication of force, very high forces can be generated.



The pump has the most critical lubrication requirements of any of the components in a hydraulic system, and generally it is the pump which determines the type of hydraulic fluid to be used in the system

## What Can Go Wrong?

Given that the system is mechanically sound to begin with, and the most suitable fluid is used, a major reason why hydraulic systems fail is due to contamination of the fluid, causing excessive wear and poor performance. Therefore, hydraulic fluid cleanliness is extremely important. The common sources of solid contamination include rust, corrosion and dirt. These contaminants can cause blockages and wear in areas such as the valves, cylinders and pumps when they circulate at high pressures and flow rates through a hydraulic system.

## How to Maximize Performance?

To ensure effective operation of the hydraulic system it must be operated according to the manufacturer's guidelines. It must be clean to start with, and there should be an efficient filtration system installed. The purpose of filtration is to remove dirt, metals and foreign objects which would circulate in the hydraulic fluid. Should the oil start to oxidize, some products of oil oxidation will also be removed. And last, but certainly not least, the selection of the correct hydraulic fluid is necessary to maximize performance

## Selecting an Hydraulic Fluid

In fact, choosing the hydraulic fluid that is most compatible with the system and operating environment is the first step to an efficient and long lasting hydraulic system.

### The hydraulic fluid must perform two key functions:

- Act as a power transfer medium
- Prevent wear

The fluid must therefore be relatively incompressible in order to effectively transmit power and lubricate the moving parts to reduce friction and minimize wear.

The choice of viscosity is made based on the oil film thickness required to keep separated the metal surfaces of the moving components, such as in the pump (bearings, gears/vanes/pistons), valves and cylinders. The pump is usually the most critical part of the system with respect to viscosity, and pump manufacturers' recommendations on oil viscosity generally dictate the oil that should be used in the hydraulic system. If, for some reason, you are unsure whether to select a particular viscosity grade (for example, ISO 46 or 68), it is a good rule of thumb to use a fluid one viscosity grade higher



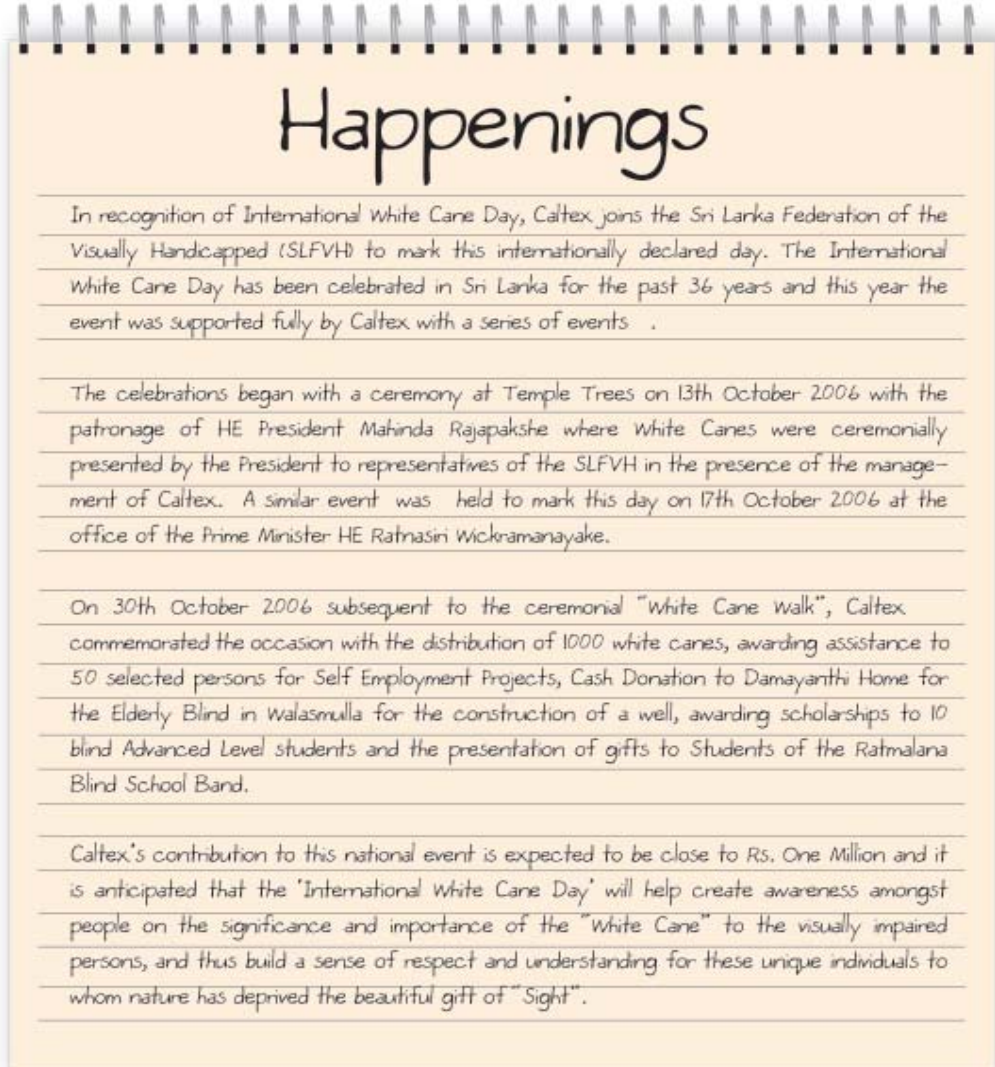
Anti-wear additives are included in hydraulic fluid formulations to provide longer equipment life by protecting surfaces when the load causes breakdown of the lubricant film. Other evidence of the anti-wear performance of hydraulic fluids can be identified by Performance Standards – for example, standards for such manufacturers and industry organizations as Denison Hydraulics, Vickers, Cincinnati Milacron, German DIN Standards, etc.

In the course of your normal duties, you will have to make decisions regarding the selection of a suitable hydraulic fluid for a particular application based on the three properties we have just discussed.

### හයිඩ්‍රොලික් පද්ධතිය හා ලිහිසිකරණය

හයිඩ්‍රොලික් පද්ධතියේදී සිදුවන්නේ දුර්වල කරණ පීඩන බල ශක්තිය සම්ප්‍රේෂණය වීමයි. මෙවර රථ වල සිරිංග ක්‍රියාත්මක වන්නේද මේ සංසිද්ධිය මඟය. හයිඩ්‍රොලික් පද්ධතිය කරණ වීමාල බලයක් ප්‍රේෂණය කළ හැකිය. විශේෂයෙන් එම පද්ධතිය අතිශයින් කරලය. එහි ක්‍රියාකාරීත්වය හඳුනා ගැනීමේ අපහසු කැස. එහි සුවිශේෂ ගුණාංගයක් ඇත. එහි හිතා වෙනස් තත්ත්වය බලයක් සම්ප්‍රේෂණය කළ විලව වඩා දිග දුරක් බලය ක්‍රියාත්මක කළ හැකිය.

හයිඩ්‍රොලික් පද්ධතියේ වඩාත් ප්‍රධානතම අංගයක් ලෙස සැලකිය හැක්කේ හයිඩ්‍රොලික් පොම්පයයි. මෙහි වර්ග කිහිපයක් වේ. හිතර පොම්ප පිස්ටන් පොම්ප වේත් පොම්ප ලෙස මෙහි වර්ග තුනක් හඳුන්වාදිය හැකිය. මේ පොම්ප වර්ග තුනෙන් එකිනෙකට වෙනස් බලයක් උපයා කරනු ලබයි. වඩාත් සුලබ හයිඩ්‍රොලික් පොම්පය වන්නේ හිතර පොම්පයයි. එහිත් උපකරණ වන්නේ මධ්‍යම ප්‍රමාණයේ බලයකි. හයිඩ්‍රොලික් පද්ධතිය බොහෝමයක් කර්මාන්ත සඳහා යොදාගනී. මන්ද එහි බලයක් සම්ප්‍රේෂණය වඩා හොඳින් සිදුවන බැවිනි.




## Happenings

In recognition of International White Cane Day, Caltex joins the Sri Lanka Federation of the Visually Handicapped (SLFVH) to mark this internationally declared day. The International White Cane Day has been celebrated in Sri Lanka for the past 36 years and this year the event was supported fully by Caltex with a series of events .

The celebrations began with a ceremony at Temple Trees on 13th October 2006 with the patronage of HE President Mahinda Rajapakse where White Canes were ceremonially presented by the President to representatives of the SLFVH in the presence of the management of Caltex. A similar event was held to mark this day on 17th October 2006 at the office of the Prime Minister HE Ratnasiri Wickramanayake.

On 30th October 2006 subsequent to the ceremonial "White Cane Walk", Caltex commemorated the occasion with the distribution of 1000 white canes, awarding assistance to 50 selected persons for Self Employment Projects, Cash Donation to Damayanthi Home for the Elderly Blind in walasmulla for the construction of a well, awarding scholarships to 10 blind Advanced Level students and the presentation of gifts to Students of the Ratmalana Blind School Band.

Caltex's contribution to this national event is expected to be close to Rs. One Million and it is anticipated that the 'International White Cane Day' will help create awareness amongst people on the significance and importance of the "White Cane" to the visually impaired persons, and thus build a sense of respect and understanding for these unique individuals to whom nature has deprived the beautiful gift of "Sight".




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