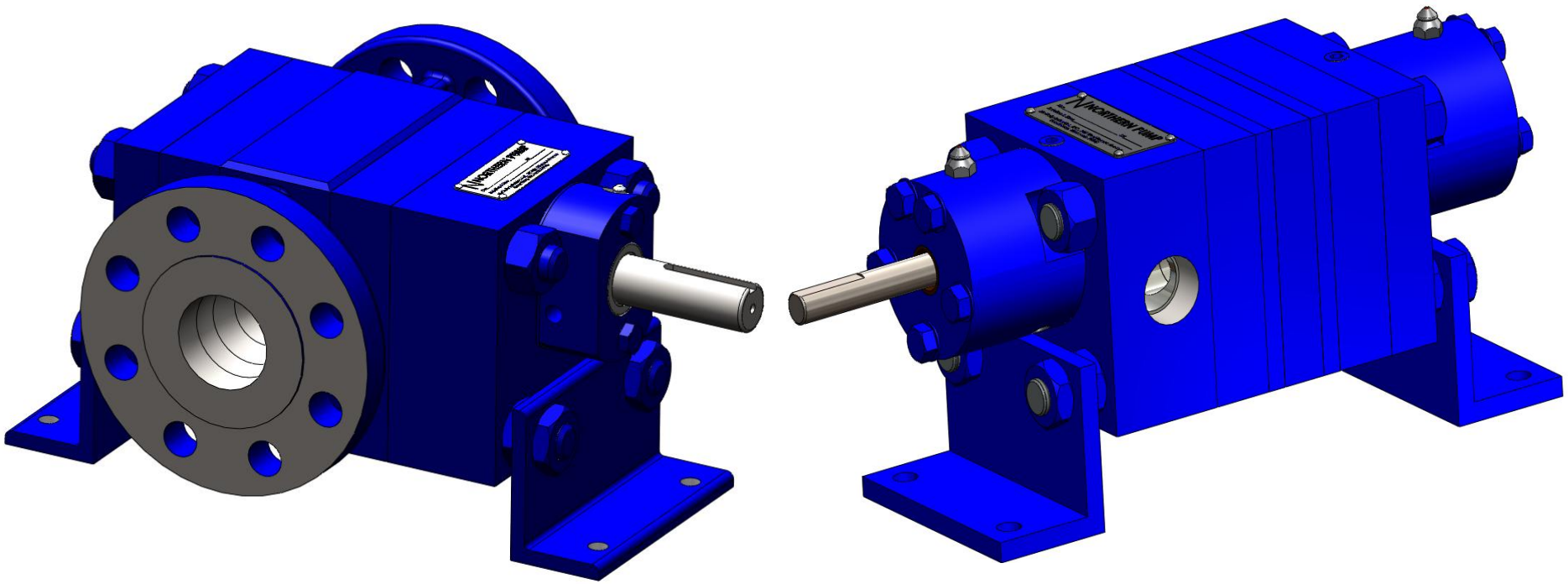
Understanding Life Cycle Cost



How your Northern® saves you money

Reference: Hydraulic Institute (www.pumps.org)

What is Life Cycle Cost?

- **The life cycle cost (LCC) of any piece of equipment is the total "lifetime cost to purchase, install, operate, maintain, and dispose of that equipment.**

- **The components of a life cycle cost analysis typically include initial cost, installation and commissioning costs, energy costs, operation costs, maintenance and repair costs, down time costs, environmental costs, and decommissioning and disposal costs.**

- **Some studies have shown that 30% to 50% of the energy consumed by pump systems could be saved through equipment or control system changes.**

Calculating the total Life Cycle Cost

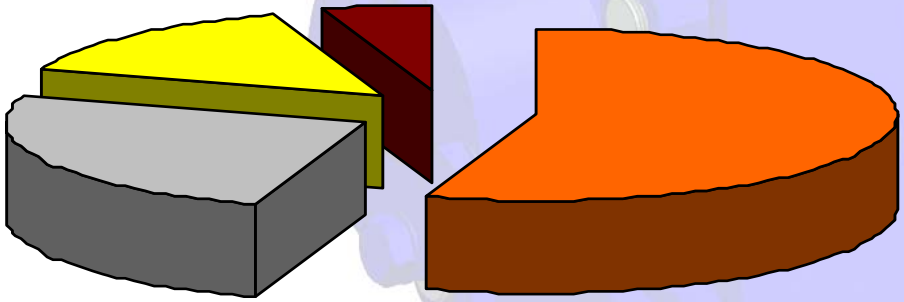
$$LCC = C_{ic} + C_{in} + C_e + C_o + C_m + C_s + C_{env} + C_d$$

Whereas…..

LCC	=	life cycle cost
C_{ic}	=	initial costs, purchase price (pump, system, pipe, auxiliary services)
C_{in}	=	installation and commissioning cost (including training)
C_e	=	energy costs (predicted cost for system operation, including pump driver, controls, and any auxiliary services
C_o	=	operation costs (labor cost of normal system supervision)
C_m	=	maintenance and repair costs (routine and predicted repairs)
C_s	=	down time costs (loss of production)
C_{env}	=	environmental costs (contamination from pumped liquid and auxiliary equipment)
C_d	=	decommissioning/disposal costs (including restoration of the local environment and disposal of auxiliary services)

C_{ic} - The initial cost usually include the follow items:

- Engineering (e.g. design and drawings, regulatory issues)
- The bid process
- Purchase order administration
- Testing and inspection
- Inventory of spare parts
- Training
- Auxiliary equipment for cooling and sealing water



Energy Cost
Other Costs
Initial Purchase Price
Maintenance Costs

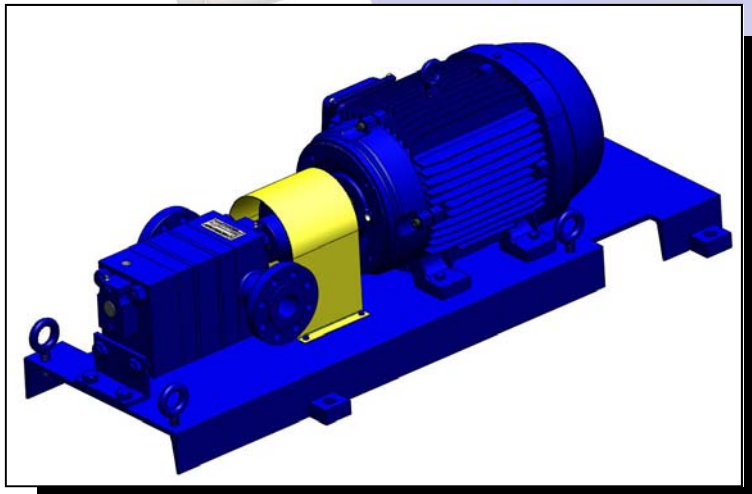
**According to Hydraulic Institute - "A Typical LCC for an Industrial Pump"*

Money Saving Fact.....

Because Northern gear pumps are designed for your specific application, the initial cost can be higher than our competitors. However, the initial purchase price is relatively insignificant to the overall life cycle cost. Our pump performance is extremely predictable and reliable, which equates to less down-time and less maintenance cost.

C_{in} – Installation and commissioning costs include:

- –Foundations – design, preparation, concrete and reinforcing, etc.
- –Setting and grouting of equipment on foundation
- –Connection of process piping
- –Connection of electrical wiring and instrumentation
- –Connection of auxiliary systems and other utilities
- –Provisions for flushing or ‘water runs’
- –Performance evaluation at start-up



Money Saving Facts.....

Every Northern Pump is performance tested, and taken through a controlled break in. This is done in comparison to the actual customer duty conditions of the pump. This greatly reduces the likelihood of a delay during the start-up process.

Northern Gear Pumps can be mounted at the factory, or incorporated into a number of different systems. This reduces the need to waste critical process time aligning the pump. This also greatly reduces the risk of misalignment.

C_e – Energy costs:

- **Energy consumption is often one of the larger cost elements and may dominate the LCC, especially if pumps run more than 2000 hours per year**

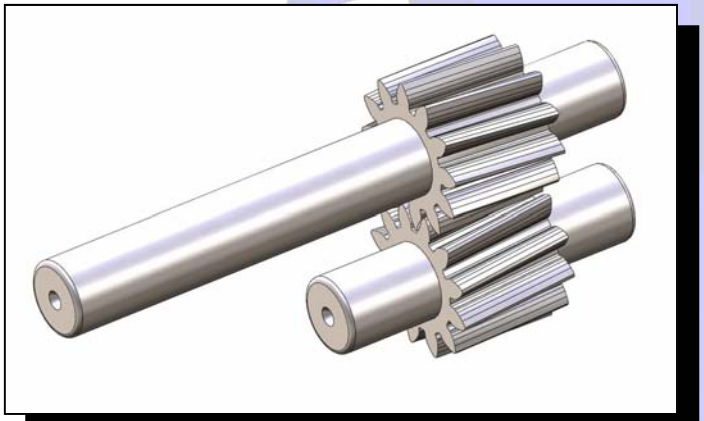
- **The input power calculation formula is:**

$$P = \frac{Q \times H \times s.g}{366 \times \eta_p \times \eta_m} \quad \text{[kW]} \quad \text{(metric)}$$

$$P = \frac{Q \times H \times s.g}{3960 \times \eta_p \times \eta_m} \quad \text{[hp]} \quad \text{(U.S. units)}$$

Whereas.....

P	=	Power
Q	=	rate of flow, m^s/hr (US gpm)
H	=	head, m (ft)
η_p	=	pump efficiency
η_m	=	motor efficiency
s.g.	=	specific gravity



Money Saving Facts.....

Most Northern Pumps are at least 85% volumetrically efficient. Less slip past the gears means less energy to run the pump .

We also have access to virtually every brand of electric motor. We only select the most efficient motor for the job!

C_o – Operation costs:

- Operation costs are labor costs related to the operation of a pumping system.
- These will vary widely depending on the complexity and duty of the system
- Obtaining optimum working life from a pump requires regular and efficient servicing.

Money Saving Facts.....

Northern Engineers always select the materials that will offer the best long term performance. B-10 Bearing life or the PV value is always reviewed for every new application.

Many of our pumps last 25-50 years before they require maintenance!

C_m – Maintenance and Repair Costs:

- **The total cost of routine maintenance is found by multiplying the costs per event by the number of events expected during the life cycle of the pump.**

- **The cost of unexpected downtime and lost production is a very significant item in the total LCC and can rival the energy costs and replacement parts costs in its impact.**

Money Saving Facts.....

Northern offers a factory rebuild program which will recondition your pump back to it's original condition. After a careful disassembly process, the entire pump is inspected to determine parts that need replacement or reconditioning. In nearly all cases, pump components not exposed to wear can be re-used, which saves you time and money.

Every refurbished pump carries a full factory warranty.

C_s – Downtime and Loss of Production Costs:

- **Despite the design or target life of a pump and its components, there will be occasions when an unexpected failure occurs. In those cases where the cost of lost production is unacceptably high, a spare pump may be installed in parallel to reduce the risk. If a spare pump is used, the initial cost will be greater but the cost of unscheduled maintenance will include only the cost of the repair**

- **The cost of lost production is dependent on downtime and differs from case to case.**

Money Saving Facts.....

Because of our skilled manufacturing team, Northern Pump can duplicate or replace virtually every pump that we have previously manufactured. We have historical drawings and records of all pumps available for quick reference, which makes it simple to duplicate. Since we manufacturer most parts in our Wisconsin facility, we can completely duplicate or customize a pump to meet your needs. Building a spare or replacement is quick, and also reduces down time.

C_{env} – Environmental Costs:

- **The cost of contaminant disposal during the lifetime of the pumping system varies significantly depending on the nature of the pumping product. Certain choices can significantly reduce the amount of contamination, but usually at an increased investment cost.**

Money Saving Facts.....

When your application requires a safe and reliable gear pump, Northern is a logical answer. The quality of Northern precision gear pumps help to prevent leaks and failures.

C_d – Decommissioning/Disposal Costs:

- **The cost of disposing of a pumping system will vary with different designs.**

- **When disposal is very expensive, the LLC becomes much more sensitive to the useful life of the equipment**