Life Sciences

INDUSTRY

- **Lead/lag selection**
- **Load cycling based on hours run**
- **Load cycling based on time of day**

Pump Sequence Control
Application Note

One of the areas within a boiler plant that is critical to the process is the delivery of boiler feedwater. Depending on the design and functionality, individual feed pumps servicing individual boilers or a bank of feed pumps may maintain a common feedwater pressure that feeds into the boilers.

Implementing pump sequence control allows the system to sequence and cycle pumps such that a minimum number of pumps are needed to maintain the feedwater flow to the boilers requiring it. The pump sequence control can also regulate (where variable speed pumps have been implemented) the output of each pump making its usage more energy efficient.

Pump efficiency is the ratio of the useful output power of the pump to its input power. The typical range of pump efficiencies is from 60 to 85% and is a function of changes in speed, impeller diameter and specific gravity as defined in the following equation

$E_p \mu Sw\ Q\ P_t / P_i$

Where

E_p is the pump efficiency (%)
Sw is the specific weight of the transported liquid (kN/m3)
Q is the pump capacity (m3/s)
P_t is the head pressure (bar)
P_i is the power input (kW)

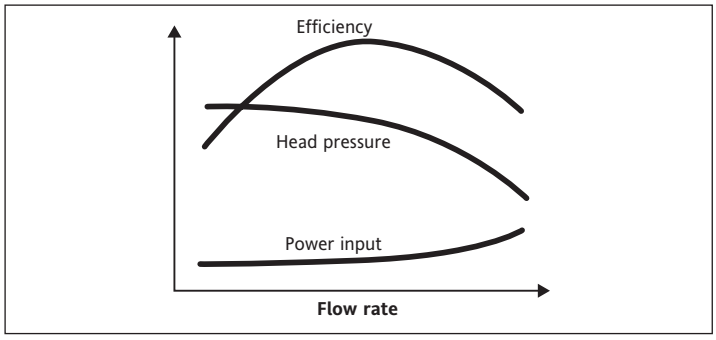

Figure 1 Pump characteristics

At a given impeller diameter and specific gravity, pump flow is linearly proportional to pump speed, pump discharge head relates to the square of pump speed and pump power consumption is proportional to the cube of pump speed. This is why variable-speed pumps can be so highly energy efficient.

A pumping system is optimised when it meets the process demand for liquid transportation at minimum pumping cost in a safe and stable manner.

Once the equipment is installed, the potential for optimisation is limited by the capabilities of the selected equipment, piping configuration and control implementation.

Full automation of pumping stations, including automatic start-up and shutdown and optimised supply-demand matching, offers the following

- Reduction in operating costs
- Protection from loss of control
- Reduced maintenance and cycling
- Increased operating safety as human errors are eliminated

Depending on plant requirements and the type of application, the pump arrangement can be either parallel or serial as shown in Figures 2 and 3.

Series pumping is most effective when the system head pressure curve is steep. When head pressure is not a constraint, parallel pumping is preferred.

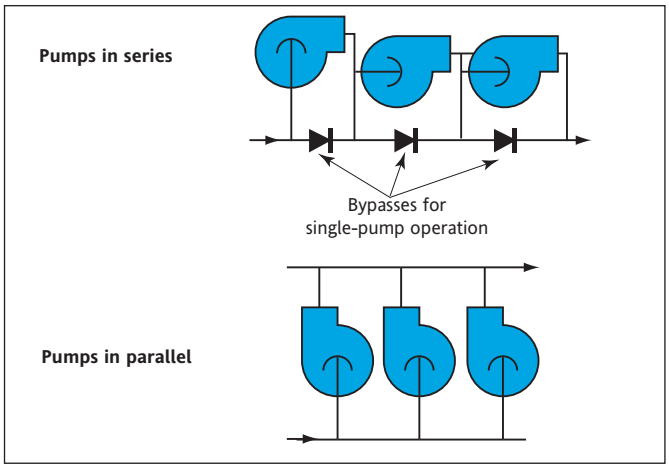

Figure 2 Multiple pump layout

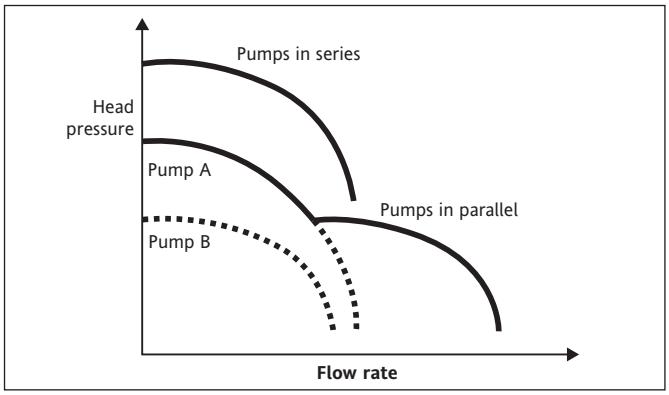

Figure 3 Head pressure - flow rate curves

The Eurotherm control module for pump sequencing allows efficient management of pump load and offers a robust control combined with a powerful man-machine interface.

Lead/lag selection

The control module scheduler arrangement allows the pumps to be run such that the use of each pump is prioritised according to a defined order. If a running pump fails, the next available pump is automatically requested to run.

The pump that is always chosen to run is referred to as the 'Lead' pump. The other pumps are 'Lag' pumps but are prioritised such that a pump with a higher priority always runs before a pump with a lower priority. The lead/lag selection and prioritisation can be set either by the operator or automatically by the application database.

These features mean that

- On an increase of demand, the most efficient pump is started first
- On a decrease of demand, the least efficient pump is stopped first

Features

Management and maintenance activities require a strong and effective man-machine interface, providing the operators, supervisors or plant engineers at any time with an informative and real-time representation of the process.

The control module offers, depending on the application needs, features such as load cycling based on hours run or time of day. Flexibility and ease of configuration combined with a powerful functionality make this control module an essential element in industry applications requiring high efficiency pumping systems at reduced operating costs.

Eurotherm: International sales and service

AUSTRALIA *Sydney*
T (+61 2) 9838 0099
E *info.au@eurotherm.com*

AUSTRIA *Vienna*
T (+43 1) 7987601
E *info.at@eurotherm.com*

BELGIUM & LUXEMBOURG
T (+32) 85 274080
E *info.be@eurotherm.com*

BRAZIL *Campinas-SP*
T (+5519) 3707 5333
E *info.br@eurotherm.com*

CHINA
T (+86 21) 61451188
E *info.cn@eurotherm.com*

Beijing Office
T (+86 10) 63108914
E *info.cn@eurotherm.com*

Guangzhou Office
T (+86 20) 38106506
E *info.cn@eurotherm.com*

DENMARK *Copenhagen*
T (+45 70) 234670
E *info.dk@eurotherm.com*

FINLAND *Abo*
T (+358) 22506030
E *info.fi@eurotherm.com*

FRANCE *Lyon*
T (+33 478) 664500
E info.*fr@eurotherm.com*

GERMANY *Limburg*
T (+49 6431) 2980
E *info.de@eurotherm.com*

HONG KONG
T (+85 2) 28733826
E *info.hk@eurotherm.com*

INDIA *Chennai*
T (+91 44) 24961129
E *info.in@eurotherm.com*

IRELAND *Dublin*
T (+353 1) 4691800
E *info.ie@eurotherm.com*

ITALY *Como*
T (+39 031) 975111
E *info.it@eurotherm.com*

KOREA *Seoul*
T (+82 31) 2738507
E *info.kr@eurotherm.com*

NETHERLANDS *Alphen a/d Rijn*
T (+31 172) 411752
E *info.nl@eurotherm.com*

NORWAY *Oslo*
T (+47 67) 592170
E *info.no@eurotherm.com*

POLAND *Katowice*
T (+48 32) 2185100
E *info.pl@eurotherm.com*

SPAIN *Madrid*
T (+34 91) 6616001
E *info.es@eurotherm.com*

SWEDEN *Malmo*
T (+46 40) 384500
E *info.se@eurotherm.com*

SWITZERLAND *Wollerau*
T (+41 44) 7871040
E *info.ch@eurotherm.com*

UNITED KINGDOM *Worthing*
T (+44 1903) 268500
E *info.uk@eurotherm.com*
www.eurotherm.co.uk

U.S.A. *Leesburg VA*
Eurotherm Inc.
T (+1 703) 443 0000
E *info.us@eurotherm.com*
www.eurotherm.com

ED57

Printed on recycled paper in England 02.09