

DOSING DONE DIFFERENTLY

A new dosage pump solution offers more than just lower life-cycle costs — Pump efficiency is energy efficiency. But do you have to sacrifice dosing accuracy for energy saving? As power consumption becomes a premier cost factor for pumps, one should consider alternative technologies.



Source: ©Wanner [M]Beeger

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As major users of pumps, the chemical as well as the oil and gas industries are concerned with the costs of owning and operating them. Today, continuing rises in the cost of energy have outstripped other elements of Life Cycle Costs. Thus, pump efficiency is the key to energy saving.

Since it varies considerably from one type of pump to another, the specifier needs to be alert to differences between basic pump technologies. Metering and dosing is one sector in which such differences are clearly seen. Flow rate must be accurate, consistent and should be independent of system

pressure. In many applications pumps are required to function repetitively over long periods, exposing them to extra risk of energy wastage through loss of efficiency. Poor selection of the metering pump impacts directly on that of the system it serves.

Where high accuracy is demanded, 'true' metering pumps are preferred. Perhaps only two types are widely acknowledged to qualify. Each type is seal-free, operating at low and high discharge pressures, but the two differ in principle—and in the energy they use. Traditional metering pumps offer a variety of designs but are recognizably similar in approach. Pumps of this type have a single large diaphragm per head. That means a large variation, some 323%, between average and peak volumetric displacement. It leads to widely varying pressure on the suction, increasing acceleration head losses. On the discharge, it can create problems such as cracked pipe connections and leaking chemicals.

The wide differential between average and peak displacement also results in torque variations at pump shaft and motor shaft. As current in a motor is proportional to torque, there is large variation between peak current and root mean square (rms) current; ultimately leading to poor efficiency and much higher energy usage. To deal with these problems, pulsa-

tion dampeners are required, with all the associated issues of installation cost, strict monitoring and maintenance. By contrast, the Hydra-Cell pumps by Wanner Engineering, incorporate three or five small diaphragms flexing sequentially in one head. This construction is fundamental in reducing the energy consumption. Variation between average and peak volumetric displacement is 14% and 4.4% respectively. In most systems there is no need for pulsation dampeners. Their cost and associated service and maintenance costs, are minimized or saved.

Low Flow, High Pressure

To apply the full benefits of multi-diaphragm technology to the many systems needing a combination of low-flow and high pressure, Wanner has developed a unique new metering pump—the MT8 which is now ready for sale after a rigorous test programme. The MT8 is designed for high accuracy at flows from 30 down to 0.23l/h with a maximum outlet pressure of 241 bar. It is the first triplex metering pump (with three diaphragms in one liquid end) able to match these ratings. The pump exceeds API performance standards for Linearity, Repeatability and Steady State Accuracy.

In a detailed formal document from Germany's internationally-recognised Nano-Saar Laboratories the MT8 was reported to have performed well with all liquids. Tests were conducted at pressures ranging from 10 bar to 220 bar. No blockage occurred. Aqueous and solvent-based pigment preparations were processed through different MJR devices, creating a hydrodynamic pressure before the reaction chamber. The applied pressure creates liquid jets which

impinge in the middle of the chamber resulting in high turbulence, impact force and shear. 'Various organic and inorganic pigments were processed, each at pressures ranging from 10 bar to 220 bar. Carbon blacks, inkjet dispersions and emulsions were also processed.'

Favourable Feedback

Positives included 'high pressure capability, tunable low-flow rate, solvent resistance, and low pulsation, with no requirement for a dampener.' Also noted with approval is that the design is 'open', meaning that when the MT8 is shut down, both ports stay open for functions such as internal cleaning. The MT8 is already in service in the USA, Europe and the Far East on various applications. They include catalyst injection, replacing plunger pumps in a polyurethane process and the applica-

tion of additives to natural fibres in the creation of roofing materials.

At Kansas City Power & Light in the USA, a formal field test transposed into a permanent installation. The MT8, on boiler feed service, runs at 186 bar with flow rates between 13.2 and 22.7l/h.

When the initial six month trial was completed, the power station was reluctant to return the pump, even though at three months it had become noisy and flow rate was down. The plant simply increased speed to compensate. Investigation later explained the pump's behaviour: a partially blocked filter ahead of the suction inlet had caused cavitation. However, the pump was protected by its many design features.

A plant engineer at KCP&L reported: "We used the MT8 to add phosphate solution to our boiler drum. It works great. We don't have any issues with it. Other pumps were having issues overcoming drum pressure, but the Hydra-Cell pump has no problem. The line restriction did not affect the ability of the MT8 to produce



Source: Wanner

Battery of Hydra-Cell MT8 metering pumps on extrusion system at pet food plant.

the amount of pressure needed to pump into the drum." KCP&L later confirmed their satisfaction, buying several more MT8 pumps and control units.

More than Just Metering

Metering is not the only active element in Wanner's pump development programme. In recent years the company has continued major expansion of its high-horsepower process pump ranges. In 2014 a new T100 Series model was introduced (flows to 366l/min, pressures up to 345 bar). In 2016 the new 2-model Q Series of quintuplex pumps was launched. These pumps feature five diaphragms in a single head giving exceptionally smooth flow at rates up to 595l/min and 103 bar and 246l/min and 241 bar. The latest high-horsepower pump from this manufacturer is the T200—two models, rated respectively for operating at pressures up to 207 and 241 bar, and max flows of 420 and 322l/min. In terms of flow and pressure they are the highest performing pumps in the Hydra-Cell range, and they share its distinctive features including low energy consumption in relation to performance. For every increase in flow and pressure capacity coupled with the challenges of constantly looking to reduce operational costs, energy requirement becomes even more critical to consider! Field testing of the T200, initially on oil industry applications, is near completion. In fact, the company states to have the pump already on display at Achema 2018.

>> The setup with several small diaphragms offers significant energy benefits over conventional dosing pump designs.

PROCESS-Tip

• Meet the pump experts from Wanner at Achema: Hall 8.0, Stand D51

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