

The Impact of the T Series Hydra-Cell Pump

Product report in association with Warner International

In the early 1970s William F Wanner, engineer and equipment innovator, developed a small industrial pump that broke completely with tradition – and subsequently led to the establishment in Minneapolis of the pump manufacturer Wanner Engineering, with his entrepreneur son, Bill, as co-founder.

The pump had no packings or dynamic seals. It was leak-free, handled many different liquids and was able to work over a wide range of pressures. It was a hydraulic diaphragm pump, but like no other of that type in its compact build, low pulsation and low cost relative to performance. Branded Hydra-Cell, after its distinctive operating principle, it was based on a design concept that in 2016 remains unique.

The original pump, working at pressures up to 70bar and flows up to 30l/min, was the first in a model range that has continually expanded, while also evolving technically.

Five years ago Wanner took a decisive strategic step by launching the first of its T Series models: pumps of substantially higher horsepower and performance. Hydra-Cell technology could now be realistically offered in a new marketplace of potential users – with many applications already known but previously beyond effective reach. Wide interest was forecast and the prediction seems justified...

In October 2015 the company hosted a webinar for Hydra-Cell distributors in which vice-president John Wanner and his project team presented an overview of the T Series: a progress report noting its origins, models in production, special features and great potential, as evidenced by detailed feedback from early users around the world.

Within the T Series product range, three main performance variants are now in full production, with a fourth on the verge of launch. Customers are able to match an application with low, medium or high pressure pumps. Maximum current flow and pressure ratings for the T Series as a whole are from 363l/min at 103bar to 98l/min at 345bar, with more options planned.

The T Series was originally conceived to handle severe pumping applications in the oil and gas industries. Accordingly, field trials were conducted chiefly in oilfields,

where conditions can be particularly demanding.

Successful applications reported here are in parts washing, steam generation, salt water injection and transferring unstable gasoline. Other applications have included; pumping naptha in a refinery, handling process liquid in a petrochemical plant, salt water disposal, injection of produced water and jet pump service. In all these the seal-less and packing free triplex T Series pumps offer a more cost effective direct alternative to triplex plunger pumps, which are often regarded in the industry as the type best fitted to handle some of the sector's most challenging pumping tasks. In that context the cost comparison data typified in Table 1 may surprise some readers.

Typical 3-Year Maintenance Cost Comparison

| Attributes | Hydra-Cell T Series | Plunger Pump |
|-----------------------|--|--|
| Crank Oil Replacement | Frequency: Every 3 months Material Cost: \$155 Labour Cost: 0.5 hours x \$50 = \$25 Total Cost: \$1,620 | Frequency: Every 3 months Material Cost: \$155 Labour Cost: 0.5 hours x \$50 = \$25 Total Cost: \$1,620 |
| Packing Replacement | No packing | Frequency: 1 per month Material Cost: \$600 Labour Cost: 4 hours x \$50 = \$200 Total Cost: \$28,800 |
| Plunger Replacement | Plunger does not sit in process liquid. No Plungechange required in 3 years. 10 years plus life | Frequency: Every year Material Cost: \$4,000 Labour Cost: 8 hours x \$50 = \$400 Total Cost: \$13,200 |
| Valve Set Change | Frequency: Every 2 years Material Cost: \$1,900 Labour Cost: 1 hours x \$50 = \$50 Total Cost: \$1,950 | Frequency: Every 1 year Material Cost: \$900 Labour Cost: 2 hours x \$50 = \$100 Total Cost: \$3,000 |
| Diaphragm Change | Frequency: Every 2 years Material Cost: \$790 Labour Cost: 1 hours x \$50 = \$50 Total Cost: \$840 | No diaphragms |
| Total Cost | \$4,410 | \$46,620 |

Table 1

Costs associated with packed plunger pumps can include seal wear, leading to energy waste and risk of leaks, and the extra costs of frequent maintenance and replacement of vulnerable parts. The plungers are directly exposed to the pumped liquid, and for this reason they are often made in exotic materials, or hard coated to improve corrosion and wear resistance.

In plunger pumps, to maintain packing integrity the pump is often downrated, resulting in the specification of an oversized pump for the duty - increasing cost and physical size.

Such disadvantages do not apply to Hydra-Cell pumps. Low-pulsation pumping action is achieved hydraulically by the sequential flexing of multiple diaphragms manifolded together in a single pump head. The diaphragms totally isolate oil in the drive end of the pump from liquid being pumped – there is no contact between the two liquids, and no stress on the diaphragms, which are hydraulically balanced.

Isolation of wetted parts (pump head, diaphragms, valves, etc) from the drive mechanism (which is submerged in oil) allows the pump to handle the widest range of liquids – hot or cold, low or high viscosity, caustics and acids, thin non-lubricating liquids and liquids carrying abrasive solids. A 50 micron suction strainer protects adequately against liquids for which plunger pumps might need filtration down to 10 microns.

The pumps are designed to be leak-free, with no VOC emissions: they can run dry without damage, even if the suction is closed.

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Application examples

Parts washing An OEM manufacturer of parts-wash equipment based in the mid-west was commissioned to build a hot-water washer for descaling large agricultural components after heat treatment. Scale removal called for high flow rates at high pressure. Reportedly only Hydra Cell T Series pumps were considered for this multi-pump installation, on the strength of their seal-less design and known reliability. The plant was due to go into service towards the end of 2015.

Steam generation The injection of steam is commonly used in the USA to help extract heavy crude oil from shallow wells. The boiler feed water is treated but variously sourced and not free of contaminants. Although widely used for this duty, seal-reliant plunger pumps need frequent maintenance to avoid early wear. To reduce maintenance, a Californian well company has replaced the plunger pump with a seal-less Hydra-Cell T100 pump on one of its wells. No problems reported to date.

Salt water injection A report from Illinois. This is a very common production operation to pressurise a well and move deposits. The pump works on continuous duty and, in this case, has been running since 2010 with no failures, and is rarely touched. An update in 2015 reported (over 5 years) just one change of valves and seats. Preventive maintenance involved changing the reservoir oil and diaphragms four times in the same period. The pump it replaced could not handle high suction pressures (from a centrifugal pump a 1/4 mile away) due to a reducer ahead of the plunger pump causing poor inlet conditions. Two additional T Series pumps are now to be purchased.

Transferring unstable gasoline Freedom from pulsation was a major advantage cited by plant engineers at a de-ethanisation station owned by OMV Petrom in Romania after installing a T100 pump to transfer unstable gasoline from storage tanks to a heater. This is the first stage in the fractioning process that will produce LPG and stabilised gasoline. Finding a pump that could deliver smooth flow and simultaneously satisfy other parameters was an ongoing problem for Petrom. Several solutions were tried with little success. The non-lubricating liquid must be pumped at pressure: no external leaks are acceptable, and the pump must operate reliably for extended periods on 24/7 duty.



An application in petrochemical processing

Petrom had been using a pair of metering pumps from a European manufacturer. These pumps, each fitted with a plunger head, had not solved the problem of pulsation, which is a typical limitation of conventional single-head metering pumps. Moreover, the plunger pumps were not leak-free. To replace them permanently, a diaphragm-type pump was requested. One T Series pump took on the whole workload, replacing plunger pumps and meeting all other operating parameters. The liquid handled is totally contained. Since installation in 2013 the pump has operated satisfactorily on 24/7 continuous duty and proved easy to maintain.

Some T-series design highlights

Easy access to liquid end Valves can be replaced without disturbing the pipework. Using the toolkit's screw-in studs, diaphragms can be replaced while the pump remains in-situ. No lifting equipment is needed.

Seal-less design Less frequent need for maintenance, faster servicing and lower repair costs than conventional pumps.

Dry running Even if the suction is closed or blocked, the pumps can continue to run dry indefinitely – allowing ample time to correct problems in the inlet line with no risk of damaging the pump.

Energy The pumps are energy efficient. With drive components submersed in lubricant, frictional losses through the pump are minimal. Total pumping efficiencies above 90 percent are normal and sustainable. Premature wear (with consequent fall in performance and rise in energy use) is avoided.

Maintenance training

Repair, maintenance and reliability are vital topics for users of industrial pumps – more especially when a model may be new and unfamiliar. UK-based Wanner International has an effective support system to ensure that distributors are well-trained and equipped for the task. It includes hands-on workshop and classroom training sessions run at Church Crookham and at distributor facilities overseas.

The trainers must also be trained. Two key members of the technical staff at Wanner International flew to the USA recently for an intensive 3-phase tour devoted to the T-Series. It was truly hands-on: in Phase 1, at the Wanner plant, they built a new pump from zero, tested it for 3 hours then saw it shipped.

In Phases 2 and 3, they were off to Louisiana - guests of Wanner OEM JJ Tech - to take part in a tough-looking workshop repair job and see pump skids built, before heading for the outback on a service visit to an oilfield site.

In the world of maintenance you can never know too much... ✨



An engineer from the UK builds a new pump from zero at Wanner's plant in the USA