

Paints, Coatings, Printing Ink VOC White Paper

Introduction

Six Voice of the Customer Surveys were conducted in the May to August 2005 period with significant paints, coatings, and printing inks customers of internal gear pumps. These surveys were conducted to support a lean product development process that focuses on identifying customer defined wants and providing products and/or services that meet those customer defined wants.

Description of Market and Applications

All six surveys were conducted at significant user plant sites that manufacture paints, coatings, or printing ink. The applications included unloading raw materials, transferring fluids into production areas for processing, and loading finished products to tankers.

User Identified Wants and Opportunities for Improvement

- **Trouble-free Operation:** Users in this market expressed a strong need to avoid leakage from packing and seals, and to minimize the impact of downtime. Customers in this market segment were moving from packing to mechanical seals, and wanted the ability to avoid pump leakage altogether. Long life was described as important to this market. While the pumps themselves may last twenty-five years, seal life may be only two to three months on some applications. Several users identified seal leakage, and relatively short seal life was identified as a serious area of concern with respect to the use of competitive model internal gear pumps. Shaft breakage and bushing wear were also cited as problems encountered with traditional internal gear pumps, especially where the pump is expected to withstand high differential pressures or cold starts. One respondent mentioned that experience with rods breaking in vane pumps was a reason for discontinuing the use of vane pumps.

Ease of maintenance was indicated as an important consideration. One respondent indicated that back pullout was a desirable feature, but that the need to remount the drive train to take advantage of this feature negated the advantage for pump replacement situations. (Many competitive internal gear pumps do not have a back pull out feature, and are mounted with a simple rigid coupling.) To take advantage of the back pullout feature, a space coupling must be used. One user cited that ease of seal replacement was an important consideration.

Three respondents cited relief valves as a special area of concern. Users reported experiencing problems with setting relief valves when initially commissioning the pump, and having relief valves stick open during operation. Getting the correct tension replacement spring was cited as a maintenance challenge because springs with different tensions look alike. (To address this concern, Tuthill does color code springs based on tension.) One user indicated that relief valves would “break” on “cold starts.” Relief valves were also criticized as providing an area for product build-up, presenting a cleanliness problem. One user indicated that relief valves overall created so much pain that it was the overriding deciding factor in converting many applications from gear pumps to air operated diaphragm pumps.

Air operated diaphragm pumps, in general, do not need overpressure protection, because air operated diaphragm pumps cannot produce pressure any higher than the air pressure supplied.

Clean in place was mentioned as a very important consideration to meet the specific needs of this market. With paints, coatings, and inks there are different runs for different colors and product formulations. Solvent is flushed through the system to clean the pump and piping. The area behind the rotor was mentioned as a serious difficulty for product build-up and cleaning. Users in this market want an effective way of flushing the pump between runs without having to take the pump apart to manually clean it.

It is noteworthy that two of the six users surveyed were very positive on modular ports. One user liked the flexibility to use 4" ports on a 3" pump, and another user liked the ability to easily convert between threaded and flanged connections.

- **Meeting Specified Requirements:** The primary challenge was handling a broad range of viscosities and fluids with the same pump. Viscosity ranges between 1 and 30,000 cps. One pump may be used for multiple products, and a pump for viscous liquids will likely be flushed with water-thin solvents. Any elastomers for seals must be compatible with the flushing solvents. The presence of solvents makes for an explosion proof environment requirement that favors the use air operated diaphragm pumps. (Air operated diaphragm pumps are considered inherently explosion proof and avoid the necessity of explosion proof motors.)

Some of the liquids are thixotropic causing suction side problems, and in some instances the need for oversized suction ports. The requirement for low shear in handling latex was mentioned as a reason why air operated diaphragm pumps are used on latex applications.

Reported temperatures were up to 180°F, and differential pressures up to 200 psi were mentioned for internal gear pump applications. All of the reported applications could be handled with 120 maximum GPM (nominally 2" ports) to 250 maximum GPM (nominally 3" ports) flow range pumps. It was mentioned that the internal gear pumps were generally operated at lower speeds, primarily with gear reducers and some with variable speed drives.

Two users expressed that energy efficiency was an important priority for pump selection.

Abrasive fillers/additives such as clays are in the fluid on some applications, and in these instances air operated diaphragm pumps or progressing cavity pumps are used. It should be noted that many of these applications could be served with internal gear pumps supplied with hardened wear parts. Pumps for a few of the applications are jacketed. Stainless steel is coming into use for some of the latex fluids being pumped.

The need for good technical support was cited. The emphasis was on the availability of technical information for pump selection, start-up and troubleshooting. One user expressed the importance of technical support to help resolve "mysterious problems," and indicated that good in the field technical support is not as available as it used to be.

- **Meeting Delivery Commitments:** Users in this market expressed the need for accurate delivery information, and stressed the importance of meeting delivery commitments.

Discussion of User Experience, Possible Tactics for Improvement

It was reported that many of the competitive gear pumps have packing, and that lip seal and mechanical seal upgrades are increasingly being used, especially on tougher applications. The experience with packing in competitive internal gear pumps is good reliability, but at the expense of product leakage. The experience with mechanical seals in competitive internal gear pumps is good leakage control at the expense of sharply increased downtime and maintenance. This market is attempting to transition from packing to seals, and wants help to ease making this transition. The desire is leakage control without sacrificing on reliability and downtime.

Three of the users reported using Teflon lip seals as an upgrade from packing. Reported life for the Teflon lip seals was relatively short ranging from a few weeks to a few months. The best mechanical seal experience was reported with Teflon elastomers and silicon carbide on silicon carbide hard faces. Teflon was cited as being used for elastomer compatibility with solvents. Chemical compatibility problems were reported with buna and Viton.

Conclusion and Recommendations

There are several significant opportunities for improvement areas for this market. An alternative means of overpressure protection should be explored. The products pumped in this market are sticky, so an electronic (no contact with fluid) means of overpressure protection would have clear advantages. Providing a clean in place mechanism would be an option that this market would clearly find very helpful.

A supplier that could help ease the transition from packing to seals would appear to have a strong competitive advantage. This market wants to make the transition from packing to seals without giving up anything in terms of reliability or product life. Pump designs that provide for better seal life, improved sealing technology, and better application of available technology are all relevant considerations.

Addressing the trade-offs between gear pump and air operated diaphragm pumps is a huge opportunity in this market segment. Energy efficiency was expressed as a priority concern. Air operated diaphragm pumps consume four times the power of gear pumps, but they are widely used in this segment to address the needs for handling shear sensitive liquids, fluids containing abrasives, avoiding problems with overpressure protection, and being inherently explosion proof. If gear pumps could be adapted to these special application needs, market share for gear pumps could be expanded significantly on the strength of energy efficiency.

Suppliers that provide good technical support documentation for pump selection, pump start-up and troubleshooting would have an important competitive advantage for this market. Users in this market want to be informed about the trade-offs involved with respect to pump selection and energy efficiency.

Suppliers that had well managed logistics for quoting and meeting delivery commitments would also appear to have an advantage in serving this market segment.