

# Advanced Proving Technology

## Using Flow Management Devices

### 4th Generation Unidirectional Captive Displacement Prover

As the measurement of liquid hydrocarbon products progresses towards the use of Ultrasonic meters, there has been some reluctance to use these meters in conjunction with the Uni-Directional Captive Displacer Provers (UCDP), also known as Small Volume Provers (SVP), for in-situ verification proving of flow meters.

Based on field experience with these types of meters and customer feedback, Flow Management Devices (Flow MD) decided to raise the bar in proving technology with the recent introduction of the 4th Generation product line of UCDPs (SVPs).

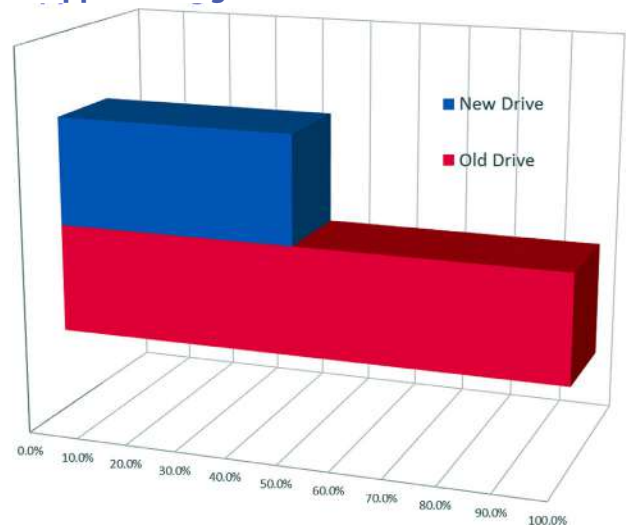
The design goal given to the engineering team was to improve all aspects of the provers performance. Some of the prover design enhancements made specifically to improve performance when used in conjunction with ultrasonic meters, or any manufactured pulse meters, include:

- Reduction in mass for all moving parts
- Increased prover responsiveness (reduced flow disturbance)
- Reduce the time required for flow stabilization after prover launch
- Reduced system drag
- Increased displaced volume (longer flight times)
- Increased seal durability and life cycle (esp. in crude service)

To achieve these goals, Flow MD launched a complete redesign of the prover drive system and poppet-piston displacer. With their new (patent pending) poppet-piston displacer assembly,

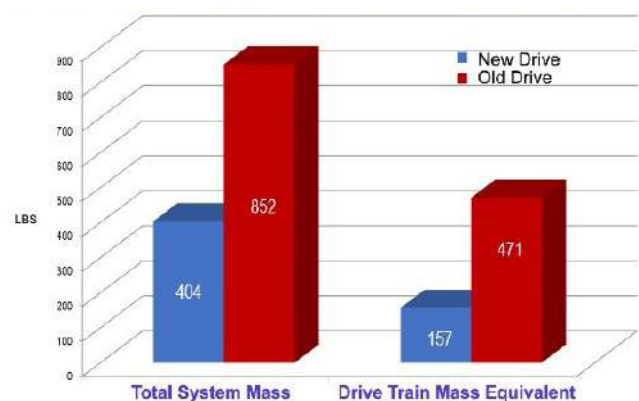
Flow MD achieved all their design goals previously listed. These enhancements resulted in significantly reduced flow disturbance during the retraction and launch of the piston, and during the closure of the assembly as it comes up to speed with the flow.

**Poppet Closing Distance vs Previous Generation**



To further improve the provers performance, Flow MD completely redesigned the drive system. The new drive system has significantly reduced mass and improved efficiency. This reduction allows for a faster reaction of the overall system while minimizing the disturbance to the flow profile during operation.

**Drive Train Optimization - Mass Impact**



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The combination of these enhancements yields significant improvements in prover responsiveness. The results are more stable flow conditions when proving, and ultimately improved proving performance with manufactured pulse meter technologies. Testing has demonstrated the new design has enhanced proving performance with both Coriolis and ultrasonic meters.

The 4th Generation Flow MD prover will allow users to meet API requirements for repeatability and uncertainty with manufactured pulse meters using smaller volumes, and with fewer passes, than ever before.

The 4th Generation Flow MD Prover is the latest proving technology available, allowing the industry to further the adoption of more advanced meter technologies.

In addition to the enhancements made to improve performance with manufactured pulse meters, Flow MD made many other general improvements to the 4th Generation Provers.

Several examples include:

- All new prover controller (PIM) with many improvements
- Easier serviceability
- Improved corrosion resistance in the drive system
- Enhanced prover validation system
- Improved drive system covers
- Windows for easy verification of system operation without the need open the covers

As the global industry leader of UCDPs, Flow MD takes meter verification very seriously. When selecting a meter and prover combination for a measurement system, many factors must be considered. The flow range of each meter technology, the liquid velocity through the measurement portion of the tube or pipe, and the flight time between the volume switches of the prover at operating flow rates should always be included as part of the equation.

Another important factor to take into account is the meter manufacturers' specific output update speed and latency. The faster the meters update speed and the lower the output latency the better the proving results will be.



4th Generation Flow Management Devices Prover Shown proving an Alto 5 Ultrasonic Meter



New PIM Installed on 4th Gen FMD-045 with load arms



Drive end with windows on FMD-045

