



DTE Energy[®]

**PHMSA R&D Workshop
November 16th and 17th 2016**

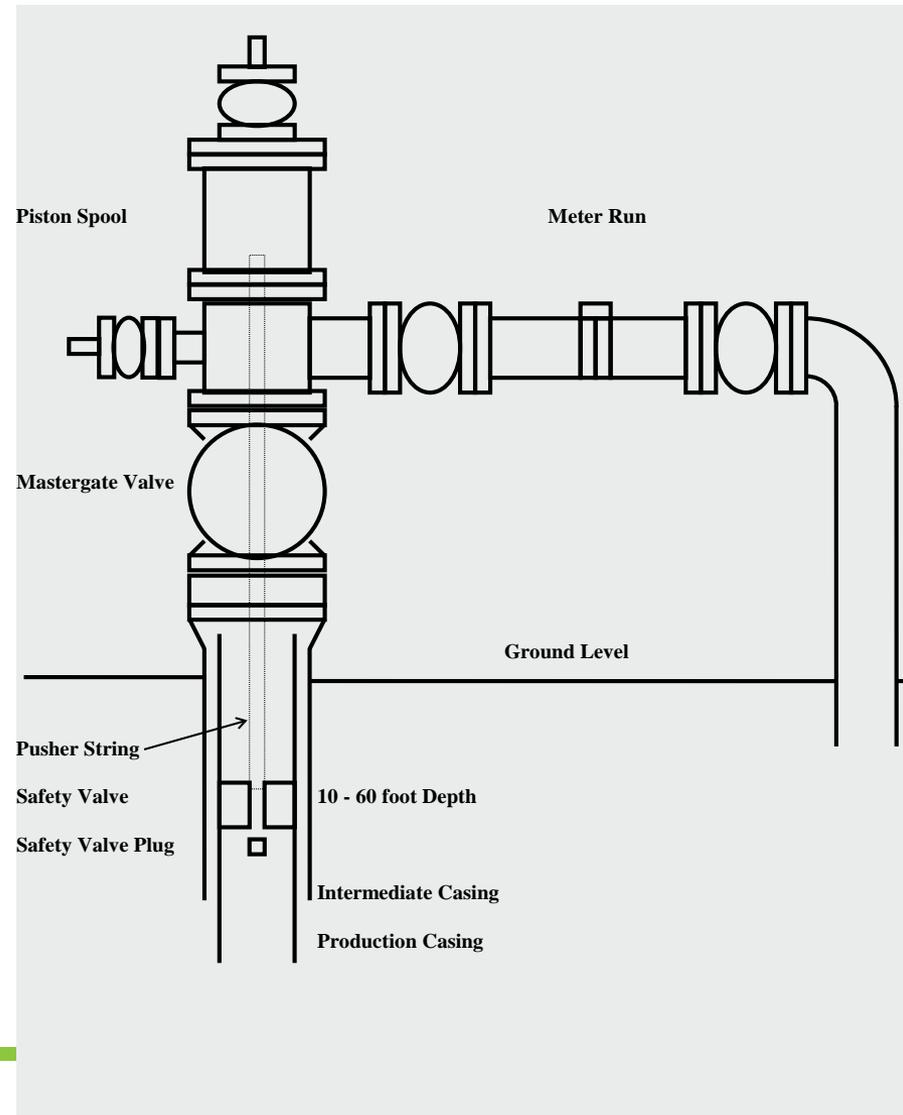
**Reservoir Engineering and Geology
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DTE Safety Valve Background



Phase 1: Safety Valves

- Installed shallow set downhole valves in the 1960's
- Held in Place Through Frictional Force
- Safety Issues During Installation and Removal
- Reliability Issues during peak winter withdrawals
- Made Mastergate Valve inoperable
- Likely to fail under a wellhead shear event



DTE Phase 1 Otis Subsurface Safety Valve



DTE Safety Valve Background



Phase 2: Safety Valves

- Installed shallow set downhole valves in 1990's
- Held in Place With Integrated Seating Nipple In Production Casing
- Control line unserviceable without high risk back off operation
- Safety Issues During Installation and Removal
- Reliability Issues during peak winter withdrawals
- Made Mastergate Valve operable



2000 Performed Storage Field Risk Assessment



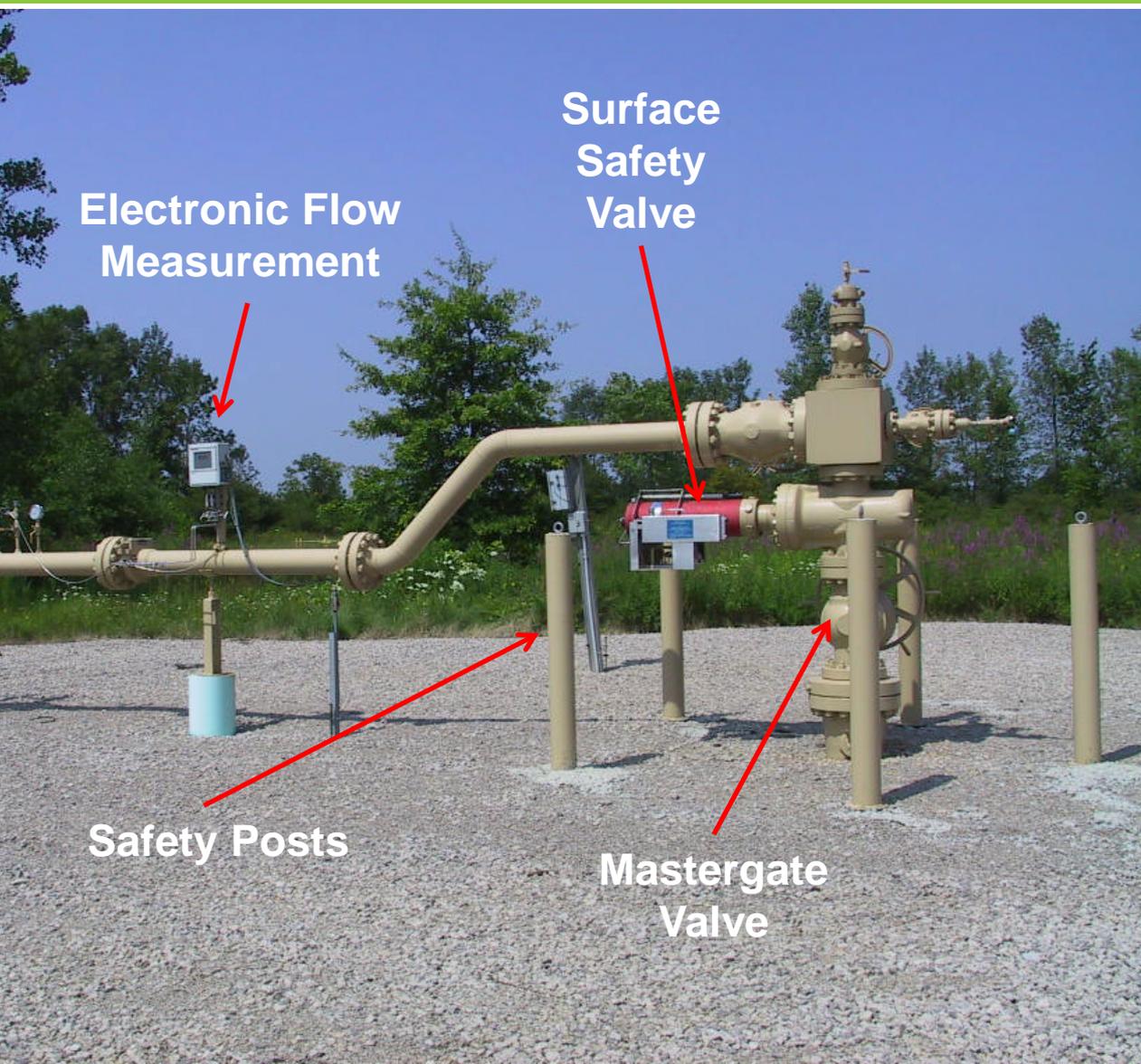
Phase 3: Safety Valves

- Partnered with PB-KBB & Dupont risk experts
- Found highest risk of uncontrolled release of gas to be attributed to well workover activity
- Found highest incident rate of uncontrolled releases of gas to occur during wellbore equipment removal (Packers, SSSV's, Tubing...etc)
- Found safety valve reliability causing higher workover frequency

CONCLUSION:

- Replace downhole safety valves with surface ones and add safety posts as an additional barrier, continue installation of wellhead electronic flow measurement devices and corrosion logging
- Approved by executive management and reviewed with state regulators
- Currently all subsurface safety valves have been replaced with surface safety valves

DTE's well site design for single well locations



Surface
Safety
Valve

Electronic Flow
Measurement

Safety Posts

Mastergate
Valve

R&D Safety Valve Focus

1. Evaluate all metal type valves with a minimal number of connections /leak points
2. New rubber materials that are more resistant to gas impregnation
3. Valves should be debris and hydrate resistant

