Plunger Lift Systems
Plunger Lift Theory

- Method of artificial lift that uses the well’s gas energy as the prime mover of liquids that have caused loading
Plunger Lift Animation
Plunger Lift System Advantages

- Requires No Outside Energy Source - Uses Well’s Energy to Lift
- Dewatering Gas Wells
- Rig Not Required for Installation
- Easy Maintenance
- Keeps Well Cleaned of Paraffin Deposits
- Low Cost Artificial Lift Method
- Handles Gassy Wells
- Good in Deviated Wells
- Can Produce Well to Depletion

- Wellflo, WFT Proprietary
Plunger Lift System Limitations

- Specific GLR’s to Drive System
- Low Volume Potential (200 BPD)
- Solids
- Requires Surveillance to Optimize
Plunger Lift System Overview

Gas Well Applications
- Usually Your First Choice
- Lowest Cost Solution
- Uses Well’s Own Energy to Lift Liquids
- Specifically Designed for Dewatering Gas Wells
- Ideal for Isolated Areas

Gas Well Challenges
- Velocities – High or Low
- Gas Liquid Ratios – Must Have Gas….
- Optimization / Maintenance
- Only Effective to the End of Tubing
- Impacted by Tubing Placement

Our Heritage:
McMurry Oil Tools
Plunger Lift System Limitations

- Specific GLRs to drive system
  - Between 500-1000 scf/bbl/1000

- Low-volume potential
  (200 bbls/day or 30 m³/day of fluid)

- Requires Surveillance
Plunger Lift Methods

- Continuous flow
  - High flow rate gas wells
- Conventional
  - Wells that require pressure build up
- Gas Lift Assisted
  - Wells without sufficient gas
- Progressive
  - Multiple plungers in the same well
Plunger Types

RapidFlo Plungers

- Spiral
- Brush
- Padded

Conventional Plungers

- Pad x Pad
- Spiral
- Brush

- No or Reduced Off Time
- Fall Through Flow
- Higher Gas Velocities Needed

- Minimum Off Time Required Based on Depth
- Can Not Fall Through Flow
- Differential Pressure Required
Conventional Plungers

- Pad x Pad
- Brush
- Spiral
- Pad x Brush
- Sizes 1 1/2”  2 1/16”  2 3/8”  2 7/8”
- All Mandrels 4140
- Pad x Pad all Parts 4140
- Pad Springs- Inconel
Lubricators

Cushions plunger upon arrival into wellhead to prevent damage

- Single or dual outlet
- Catcher option
- Sensor mount
- Threaded outlets
- Spring-loaded cap and striker pad
- 3K and 5K psi working pressure
- Serviceable top for springs
- Plunger catcher
- Dual flow or single
- 4140
- \( \text{H}_2\text{S} \) service available
The Bowen union lubricator is a spring-loaded receiver that cushions the arrival of the plunger at the surface while enabling easy access for wireline units.

The lubricator is available in 2 3/8- and 2 7/8-in. (60.325- and 73.025-mm) sizes. It is built from alloy steel 4130 or 4140 with a Rockwell Hardness C-Scale of <22.
Bumper Springs

- A Spring is used to Prevent Excessive Shock to the Plunger if it Were to Fall in Dry Tubing

- Types of Bumper Spring Combinations
  - No-Go Nose
  - Seating Cups / Standing Valve
  - Collar Stop
  - tubing Stop
  - Collet Latch
Tubing and Collar Stops

- Type A Tubing Stop
- Type F Collar Stop
- Used When Tubing is Open Ended
- Wireline Set
- Wireline Retrievable
History of Plunger Lift Control

Evolution of Plunger Lift Control

- Time Cycle Control
  » ON TIME-- OFF TIME

- Time Cycle with Plunger Arrival Recognition
  » On Time--Sales Time--Off Time

- Auto Adjust Time Cycle
  » Adjust Time Settings by Reacting to Failure

Plunger Traveling --TO FAST-TO SLOW or None

Result - Mere Guessing at Time Required to Achieve Wellhead Pressures Needed to Lift Plunger and Fluid Against Facility Pressures and How Long to Flow the Well Before it Experiences Liquid Loading Again
Weatherford Plunger Lift Controllers

Weatherford Offers The CEO Plunger Lift Controller Series

Controller Options:

- Pressure and Flow Activated
- Time Cycle
- Self Adjusting
- Telemetry Available
Today’s selection process

- Gather well data
- Run Nodal analysis program (WellFlo™)
- Input data into plunger lift program
- Review recommendations
  - Based on in-situ wellbore velocity
  - Inflow/outflow performance
  - Liquid loading program
  - Equipment recommendations
- Combine with field knowledge