

**PROVEN**

# **THE *SOLUTION* VALVE FOR-PROBLEM WELLS!**

***THE SOLUTION FOR  
BOTTOM TAGGING,  
GAS INTERFERENCE,  
AND GAS-LOCKED PUMPS***

**PUMPS BELOW  
PACKER!**



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US and Canada Patents  
World Wide Patents Pending

## The **SOLUTION VALVE (SV)** IS A PROVEN SOLUTION TO THE PROBLEMS OF GAS INTERFERENCE, GAS LOCK AND BALL FOULING!

This exclusive, patented design in travel valve technology increases pump efficiency in vertical, deviated and horizontal wells. Additionally, the **SV's** unique design works wonders in gassy fluids, heavy crude, and dirty well conditions.

### **SV's FEATURES INCLUDES:**

- Valve always opens on the down-stroke and always closes on the up-stroke.
- Exclusive design of the ported seal-stem provides greater flow capacity.
- Reversible ball and seat doubles operational life, with no extra cost.
- All popular alloys are available for balls, seats, and drag plunger. Body components are 316 stainless steel.

### **BENEFITS INCLUDE:**

- Increases production of oil and gas by lowering fluid levels.
- Eliminates need to tag bottom.
- Creates smoother loading and unloading of all valves within the pump.
- Eliminates impacting and pounding of balls and cages.
- Increases pump life and efficiency.
- Pumping below a packer.
- Minimizes stress reversals in rod string -- fewer rod parts and less rod-cut tubing.

### **ELIMINATES THE NEED FOR:**

- Expensive traveling valve accessories.
- Expensive hard balls and seats.
- Hard interior cage surfaces.

With the **Solution Valve (SV)** designed and manufactured by Eagle Innovations, Inc., you can reduce gas interference and positively eliminate gas-locking of your down-hole rod pump. No longer will you have to tag bottom in an attempt to free gas-locked valves. Expensive equipment damage and premature pump failures are eliminated! This valve is not just another ball-knocker; it represents an exclusive new design in travel valve technology. Beginning at the bottom and continuing throughout the up-stroke, the **SV** pulls itself closed by the resistance imposed to movement of its own drag-plunger. With each stroke, this feature enables the pump chamber to be completely recharged with

new fluids entering from the bottom of the hole. Immediately at the top of the down-stroke, this same drag-plunger resistance opens the **SV**, thus permitting 100% of the fluid in the pump, whether gas or liquid, to flow through it. The **SV** cannot gas lock! Acting as a mini-compressor, it will pump gas, oil, or water on each and every stroke. The Ported Seal-Stem holds the ball in a fixed position. At all times both the ball and seat remain centered within the **SV**. Failures experienced by conventional travel valves due to the impacting and fluid pounding between balls and cages are eliminated.

It is important to note that the **SV** is not just another add-on. It's a complete travel valve system that will more than pay for itself by:

- 1) Increasing production lost to gas interference and gas-locking; 2) Eliminating failures of rods, tubing, and other components involved in the pumping process which result from the shock and stress fatigue of tagging bottom; 3) Prolonging pump life associated with premature valve failures; and 4) **Pumping problem zones below a packer.**

The **SV** has been a proven performer in hundreds of wells experiencing problems with gassy and dirty fluids! **DEVIATED & HORIZONTAL WELLS**

The **Solution Valve's** patented design has also had a positive, demonstrable effect when used in horizontal and deviated wells where premature valve failures have been experienced. These failures are typically the result of uneven wear on the valves caused by non-vertical orientations. Many manufacturers of API pumping systems, using various ball and seat configurations, have attempted, with little success, to control ball position by tightening tolerances around the ball. These measures have invariably caused efficiency of the pump to drop dramatically and resulted in premature ball and seat failures.

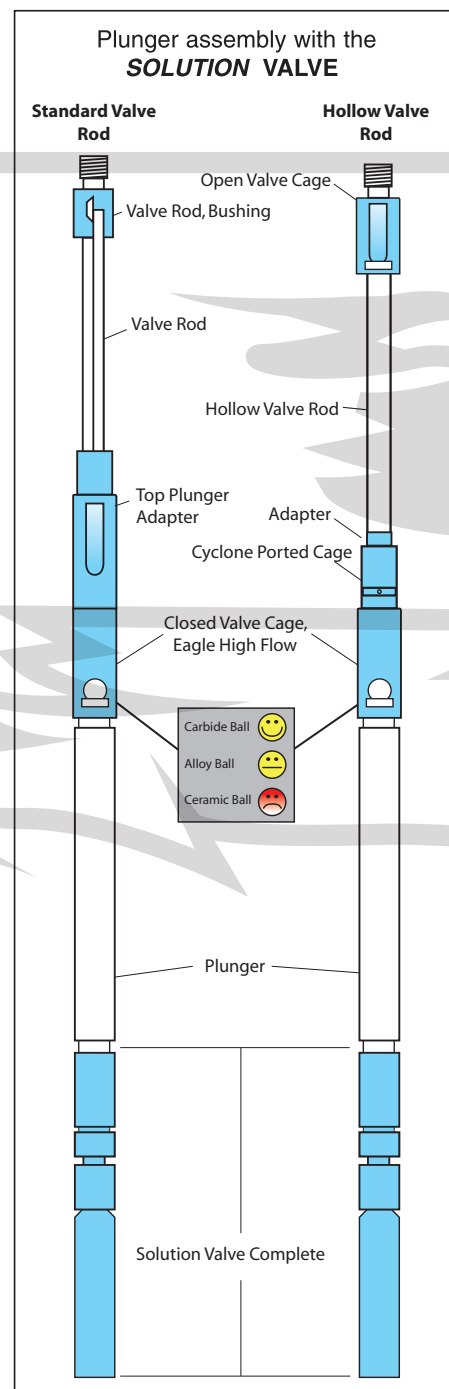
The **SV** was designed to achieve high-efficiency pumping for any down-hole orientation of the pump. Both ball and seat are always centered within the valve. The **SV** performs just as efficiently horizontally as it does vertically, because its guide system keeps the seating surfaces aligned at all times. Consequently, the **SV** immediately closes at the beginning of the up-stroke, thus improving pump efficiency. With conventional pumps often-times 20% or more of the stroke movement occurs before the ball can re-seat itself properly. Use of the **SV** results in fewer valve failures, reduced service costs, increased production, and greater volumetric efficiency.

### **HEAVY OIL RECOVERY**

Wells which produce "heavy oil" often present some of the most difficult pumping conditions incurred within the industry. However, the **SV**, with its greater cross-sectional area, has demonstrated dramatically favorable results under these

same conditions. Production has been increased from 15% to 60%, as compared to pumps with conventional travel valves acting alone. This performance also indicates a significant improvement in the fluid dynamics prevalent within the pump chamber itself. By minimizing pressure drop across the entire valve system, all valves are able to open and close much more quickly and smoothly.

When compared to other pumping systems, tests performed in difficult heavy oil applications consistently demonstrate that the improved technology of the **SV** has resulted in significant reductions in lifting costs and increases in oil production.



# THE SOLUTION



# Solutions Valve Instructions



PLEASE READ BEFORE INSTALLATION !

Your SOLUTION VALVE components are shipped hand-tight only so you can disassemble, inspect, and familiarize yourself with their functions.

To be used as directed below, a tube of Loc-Tite 263 is supplied with each SOLUTION VALVE. Loc-Tite 263 is a red, non-permanent, setting compound to be used in temperatures up to 300F; Locktite 272 should be used for higher temperatures. Loc-Tite 263 should not be confused with other red compounds which may have permanent setting characteristics.

It is very important that the enclosed setup design and these installation instructions be closely followed for your SOLUTION VALVE to function properly. Failure to do so may result in poor performance as well as premature valve failure.

1) Unscrew the Bowl from the Seat Plug. Remove the two Set Screws completely. Unscrew the Top Seat Bolt which holds the Ball to the Ported Seal Stem. Test both sides of ball and seat (four combinations) on a conventional vacuum tester by inserting a neoprene rubber plug into the hole of the ball or by holding a flat piece of neoprene rubber over the hole.

2) Apply Loc-Tite 263 on each side of both sets of threads of the Top Seat Bolt and screw the Top Seat Bolt back into the Ported Seal Stem. Torque the Top Seat Bolt as follows: 1.25"- 45 ft-lbs; 1.50"- 70 ft-lbs; 1.75"- 120 ft-lbs; 2.00"- 210 ft-lbs; and 2.25"- 340 ft-lbs. Use of a torque wrench is recommended. CAUTION: DO NOT OVER-TIGHTEN, AS THIS MAY DAMAGE THE BALL AND SEAT ASSEMBLY!!

3) Apply Loc-Tite 263 to the Set Screws, screw each into the sides of the Ported Seal Stem, and tighten to normal torque with wrench.

4) Apply standard thread lubricant to the threads of the Seat Plug, screw the Seat Plug into the bottom of the Bowl, and tighten.

5) Apply standard thread lubricant to the threads of the Drag Plunger, **PLACE DRAG PLUNGER IN PUMP VICE**, with only plunger threads extending beyond vice. Tighten vice and screw the Ported Seal Stem onto the Drag Plunger and tighten Ported Seal Stem with a friction wrench. Do not pinch or mar the vertical ports of the Seal Stem. Do not use a "crows" wrench on Ported Seal Stem. **DO NOT USE FRICTION WRENCH ON DRAG PLUNGER.**

6) Apply standard thread lubricant to the threads of the bottom of the regular plunger, screw the top of the Bowl into the bottom of the regular plunger and tighten--no additional adapters, bushings, etc., are required.

7) After testing ball and seat, install a conventional, closed-cage, travel valve with single ball and seat on top of the regular plunger. Best results achieved with a carbide or alloy ball. Ceramic balls not recommended. A satellite-lined (or satellite insert) closed-caged valve with suitable stainless steel adapter must be utilized for applications above 8500'; monel-hardened materials are recommended below 8500'. Under no circumstances should a soft-metal, 3-wing cage be used for this purpose!! **See reverse for HVR instructions.**

8) It is permissible to run a zero-extension on the bottom of the pump, but do not use longer extensions which enable the Solution Valve to be stroked out of the barrel on the down-stroke!

9) Insert the plunger and valve-rod into the barrel of the pump until the Solution Valve's Drag Plunger contacts bottom; mark the valve-rod at the top. Withdraw the valve-rod, mark and cut the valve-rod 1.50" below the top reference mark. When spaced in this manner, and allowing approximately 0.50" for thread make-up of the valve-rod into the valve-rod bushing, the resulting clearance below the Solution Valve's Drag Plunger (with the Solution Valve in the closed position) at the bottom of the down-stroke should be approximately 2.0".

10) CAUTION!! After running the pump to the bottom of the well, it should be recommended to the customer that the pump be spaced approximately 1.5 to 2.0 inches off bottom. Pump length should be adequate to prevent impact on up-stroke, and under no circumstances must the pump be allowed to tag bottom on the down-stroke!!

11) Production performance is often enhanced by holding approximately 150-200 psi back pressure on the tubing such as with a Baird back-pressure valve.

## SERVICE NOTES:

After pumping for only a short time, a visible seal-ring will begin to form around the Ball where contact is made with the Seat. Creation of this seal-ring is an intended result of the technology inherent to the SOLUTION Valve and indicates normal function of its radially-lapping, sealing mechanism.

During pumping operations, only one side of the Ball and Seat of the SOLUTION VALVE will experience wear. However, both Ball and Seat are REVERSIBLE! If necessary, just turn each of them over, reassemble all components, and reinstall the SOLUTION VALVE. Operational life is doubled with no extra cost!! Premature Ball and/or Seat wear can be a sign of an improper alloy selection(s), and if observed, call EAGLE's technical support line at 1-(800) 300-9160 for suggestions on the proper combination for your specific application.

THANK YOU for purchasing what we at EAGLE believe to be the most innovative and truly cost-saving piece of equipment available to the oil industry today ..... EAGLE'S SOLUTION VALVE!!

*\*ARP Ultra Torque Anti-Seize recommended  
for all thread connections during installation.*

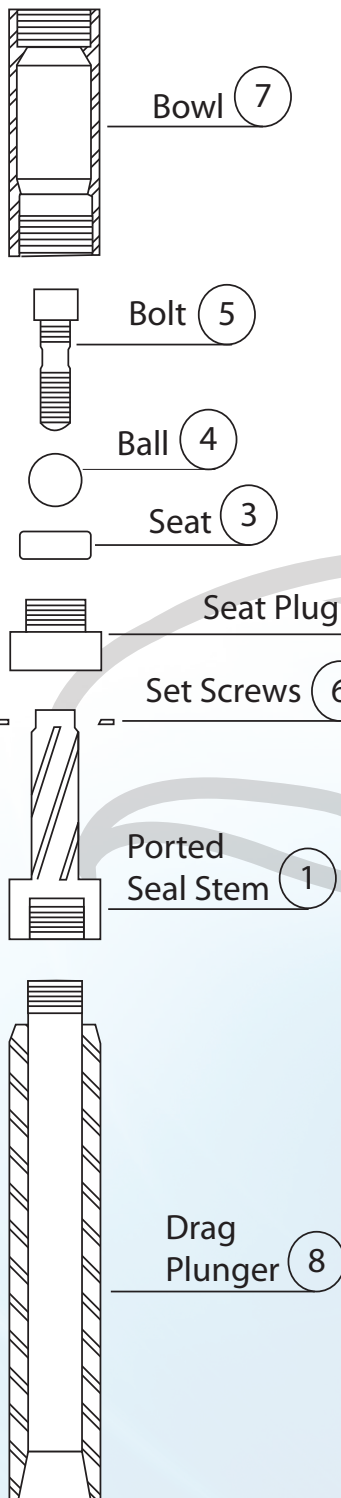
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## Dis-Assemble

### Solution Valve



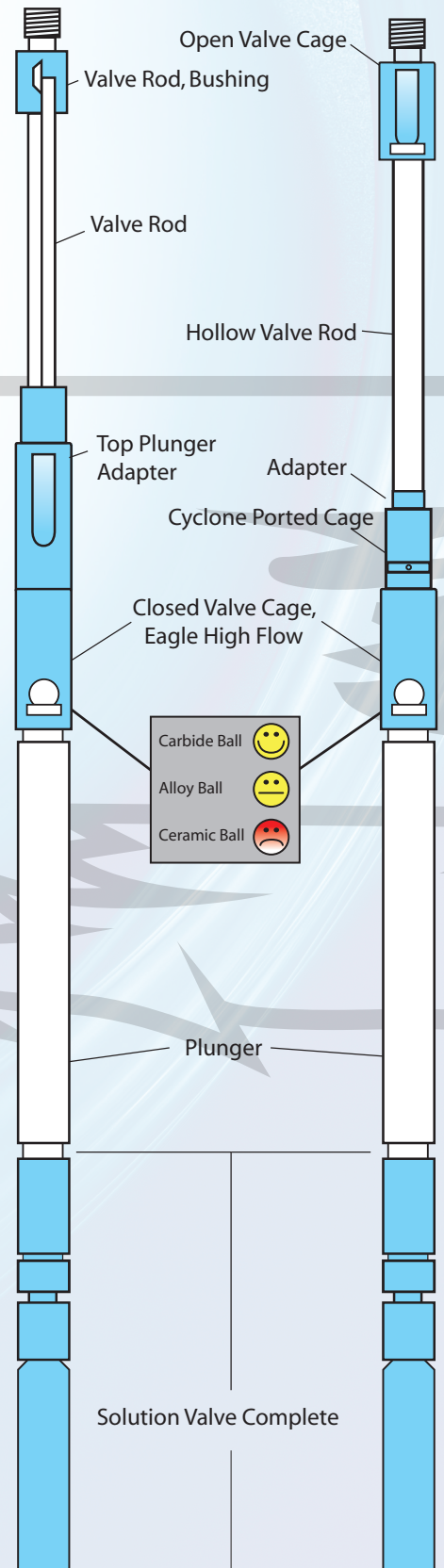
1. Remove Bowl (7) from Seat Plug (2).
2. Remove Set Screws (6) from Ported Seal Stem (1).
3. Remove Bolt (5) from Ported Seal Stem (1).
4. Remove Ball (4).
5. Remove Seat (3).
6. Unscrew Drag Plunger (8) from Ported Seal Stem (1).

## Assemble

1. Screw Drag Plunger (8) on Ported Seal Stem (1).
2. Place seat plug (2) on Ported Seal Stem (1).
3. Place Seat (3) on seat plug (2).
4. Place Bolt (5) thru Ball (4).
5. Place Loc-tite on Bolt (5).
5. Screw Bolt (5) with Ball (4) on Ported Seal Stem (1).
6. Tighten Bolt (5) to torque specification.
7. Place Loc-tite on Set Screws (6).
8. Screw Set Screws (6) into Ported Seal Stem (1).
9. Screw Bowl (7) onto Seat Plug (2).

### Standard Valve Rod

### Hollow Valve Rod



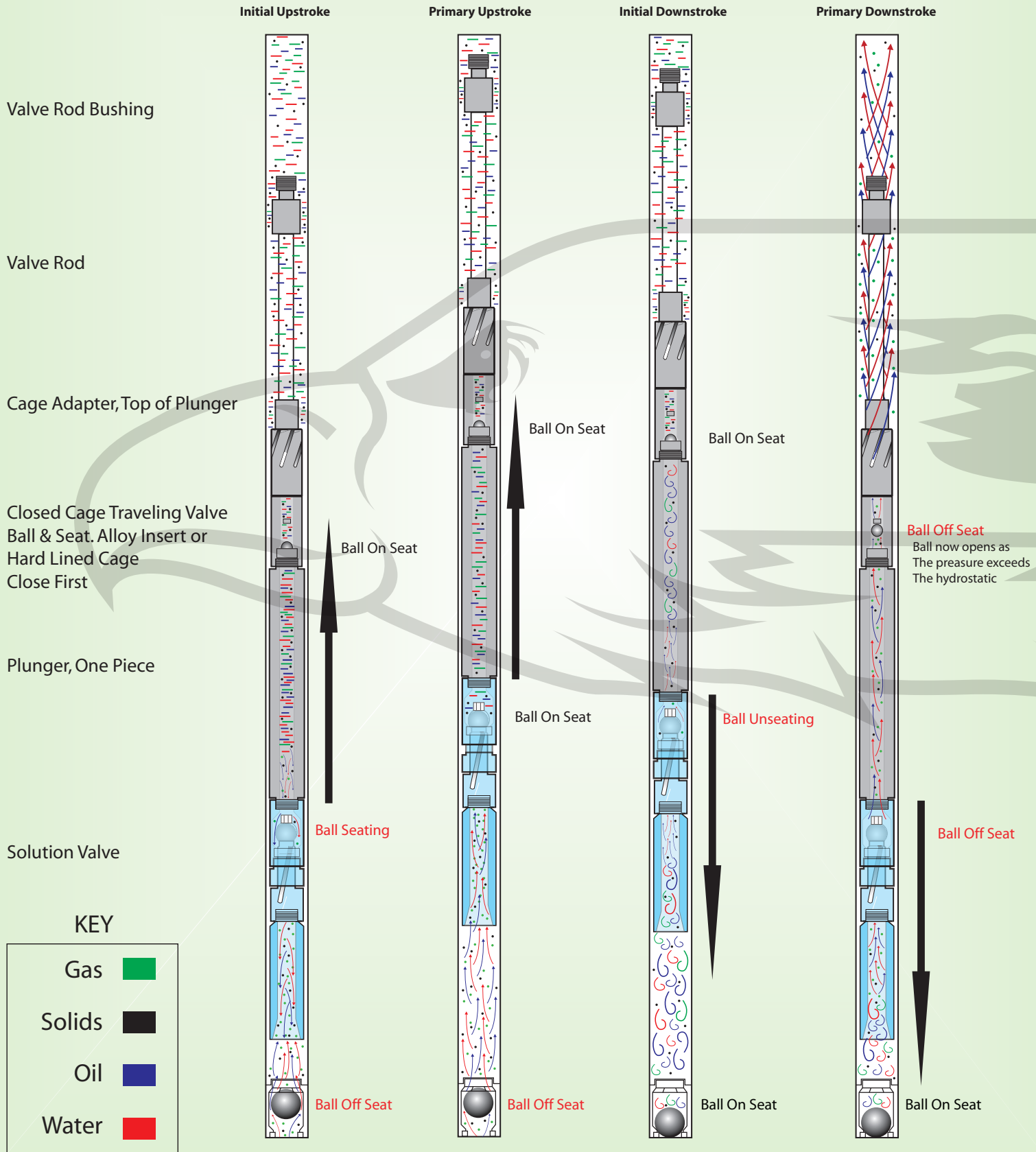


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## Example of Solution Valve operation.



## AN EAGLE SOLUTION VALVE SUCCESS!

December, 2006

### The Problem

A major oil company completed a well in November 98. A 2” insert pump was run and the well produced without a pump change until February of 2002. After that the oil company required six workovers to replace/repair pumps or repair tubing leaks which was approximately every 8 months up until December 2006. In one case the pump barrel was bent and scored and in another the spiral guide and pony rod was bent and worn. Other repairs were done due to worn plunger rings and valves.

In addition to the above the operator was experiencing low pump efficiency (50 %). Oil production was around 11 barrels per day, water production 134 barrels per day and the fluid levels were 86.2 joints from surface

For that reason they decided to pull the pump in Dec 2006.

### Solution

1. A 2” insert Pump (25-200-RWBC-20-3) using a brass nicarb barrel along with an Eagle Solution Valve and a Titanium/Tungsten ball and seat in the top traveling valve was run in the well.

2. The pump was spaced so as to prevent “tapping bottom”.

### Job Postmortem

After installing the Eagle Solution Valve the well initially pumped off. The jack was slowed down and total production went from 145 bbls per day to 218 bbls per day an increase of 50 %. Oil production went from 11 barrels per day to 19, water production went from 134 barrels per day to 199.

Using oil at \$ 55 per barrel that works out to a **daily increase of \$ 463 or \$ 168,995 yearly and payout on the Eagle Solution Valve of around 6 or 7 days.**

Pump changes and tubing leaks should drop due to the smoother loading and unloading of the valves in the pump, and the elimination of tapping bottom will reduce rod slap leading to tubing leaks. The jack speed was reduced from 6 spm to 3 which will decrease wear on the jack, rods, tubing, and pump, etc. Those savings are yet to be determined.

## AN EAGLE SOLUTION VALVE SUCCESS!

March, 2007

### The Problem

An oil company was pumping foamy oil from a gas well. They were experiencing extreme foaming issues that wouldn't permit conventional pumping. The well would surge and carry over oil into the gas pipeline causing problems at the downstream compressor. The facility operator was threatening to “kick” the operator out their pipeline and facility.

### Solution

1. An 1 1/2” insert Pump along with an Eagle Solution Valve and a Titanium/Tungsten ball and seat in the top traveling valve was run in the well.

2. The pump was spaced so as to prevent “tapping bottom”.

### Job Postmortem

After installing the Eagle Solution Valve the oil company has been able to successfully pump this well for eight months as of November 2007, and stabilize their production without any carry over into the flow line. Their operating costs have come way down and the facility operator is no longer threatening to kick them out their pipeline and facility.

Pump changes and tubing leaks should drop due to the smoother loading and unloading of the valves in the pump, and the elimination of tapping bottom will reduce rod slap leading to tubing leaks.

## AN EAGLE SOLUTION VALVE – CYCLONE PLUNGER SUCCESS!

March, 2007

### The Problem

A major oil company completed what was expected to be a flowing gas well in September 2005. The well was tied in but would not flow. The company ran an 1 ¼” insert pump landed at 1077 metres to pump the liquids. The pump would not stroke. It was pulled and silt was found in the pump. They then ran pump # 2 which worked for 5 hours and stopped. Next, they ran pump # 3, an 1 ½” insert with a ring style plunger which produced for 15 minutes and quit. They let the well sit for two days, started the pump up, and the well produced 12m3 of oil for 24 hours and quit. They pulled the pump and found solids in the pump. In November, 06 they ran pump # 4, a 1 ½”, with a Petrovalve and found there was no pump action once the pump was run. Out came the pump. The operator then considered shutting in the well.

### Solution

1. In March, 07, an 1 1/2” insert Pump along with an Eagle Solution Valve and an Eagle Cyclone Plunger Assembly was run.

2. The pump was spaced so as to prevent “tapping bottom”.

### Job Postmortem

After installing the Eagle Solution Valve and Eagle Cyclone Plunger the well has produced continuously since being installed. Oil production went from 0 barrels per day to 50.

Using oil at \$ 55 per barrel that works out to a **daily increase of \$ 2750 or \$ 1,003,750 yearly and payout on the Eagle Solution Valve & Cyclone Plunger Assembly of around 1.5 days.**

Pump changes and tubing leaks will be reduced to the smoother loading and unloading of the valves in the pump, and the elimination of tapping bottom will reduce rod slap leading to tubing leaks.

## AN EAGLE SOLUTION VALVE SUCCESS!

June, 2007

### The Problem

A major oil company was looking to increase production in the presence of gas. Pump efficiency ran at an average of 18%, total production averaged 10.71 m3 or 66.4 bbls per day of total fluid, of which oil production averaged 3.71 m3 or 23 bbls per day, water 7 m3 or 43.4 bbls per day, and gas 1.26 e3m3.

### Solution

1. A 2” insert Pump along with an Eagle Solution Valve and a Titanium/Tungsten ball and seat in the top traveling valve was run in the well.

2. The pump was spaced so as to prevent “tapping bottom”.

### Job Postmortem

After installing the Eagle Solution Valve total production went from 66.4 bbls/day to 115.8 bbls/day. Oil production went from 23 bbls/day to 34.5; a 50 % increase of 12 bbls/day, water production went from 43.4 bbls/day to 81, and gas from 1.26 e3m3 to 3.22.

Using oil at \$ 90 per barrel and a **daily increase** of 12 bbls per that worked out to a **\$1080 per day or \$394,200 yearly increase in revenue and a payout** on the Eagle Solution Valve **of around 3 or 4 days.**

Pump changes and tubing leaks should drop due to the smoother loading and unloading of the valves in the pump, and the elimination of tapping bottom will reduce rod slap leading to tubing leaks.