A DIFFERENT APPROACH TO MANAGING FLUID POUND

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Fluid pound has long been a problem with maintaining good run life of the pumping system. The result of fluid pounding is costly and deprives the industry of dollars that can be used to invest in improvements instead of repairs. With the bottom line decreasing, how can each operator remain in business and stay profitable? The cost of making that extra barrel of oil may be greater than the revenue received.

Is setting the POC to shut down the well the end result of this tool? The POC as a pump-off tool can also be used as a "Pump Optimization Center". This will enable the operator to fine tune his system.

Why does fluid pound exist? Without question, it is understood that an incomplete pump is the reason why fluid pound occurs. Fluid pound remains to be a problem when the pumping system is oversized for the production available. One common paradigm is, pumping the well down to the pump (SN) increases production. In addition, the philosophy of maximizing production (getting everything there is) remains a likely cause of pounding fluid. Reservoir performance must be considered as a fluid pound source while remembering that the pump drawdown is key.

One of the lingering problems with Fluid Pound is the omission of fluid pounding to be identified as a primary cause of failure.

Result of fluid pounds

Primary results of pounding fluid are;

1) damage to pump, seen as pump jettison, gauling, and splits;
2) rod buckling, which can be seen as rod and coupling wear;
3) tubing leaks, seen as internal wear and splits, coupled with unanchored tubing can also be external wear;
4) gear box wear, observed as broken teeth; and
5) decreased MPRL, resulting in improper POC settings.

Most of the people surveyed believed that fluid pound is probably at least 75% of the reason why wells fail. There is some thought that it's occurrence is 90% of the reason why systems fail. The challenge remains; *What can we do to reduce fluid pounds and subsequent failures?*

A tool available to control fluid pound is the Pump Off Controller (*see Figure 1*). The POC is utilized to stop the unit from operating in the event of a fluid pound. An additional use of the POC is to identify how fluid pounds can be calculated and this measurement used to reduce failures associated with pounding fluid. The installation of a POC is a **start** in managing fluid pound. It is **not the final** solution in controlling the damaging effect of pounding fluid. In fact the decline in failures (after the installation of the POC) may be minimal in comparison to other methods of system failure reduction.

Fluid Pound in Action

Making that extra barrel of oil is a misconception when the consideration is given to how much money is being made. Oil in the tank or money in the bank *(See the Excel spreadsheet with the Fluid Pound Calculator, Figure 2)*.

The Fluid Pound Calculator is a tool built to count the number of fluid pounds a unit may undergo in 24 hours and annually. The annual number is astounding when put in perspective to what the unit experiences throughout the year. When the cycle time is adjusted, the number of fluid pounds can be greatly reduced to minimize the associated damage that could occur.

In contrast to the concept that fluid pound is a catalyst to failure, the fluid pound calculator estimates how the failure ratio can be reduced by managing fluid pound. This can also be seen as increased performance in run days.

Within the Fluid Pound Calculator is a table that indicates how many barrels are produced per stroke (*see Figure 3*). When the oil cut is factored in, it can be determined how many strokes and/or minutes it takes to produce a barrel of oil.

The amount of incremental oil to be gained with that "extra" stroke is greatly exaggerated.

An aggressive approach to managing fluid pound could be a master plan. In one field a record is kept of POC settings (not via SCADA) to document current settings vs. any changes.

What does it cost to make that extra oil?

Oil in the tank does not mean money in the bank! Our business is to make money, increase cash flow, minimize expenses, optimize practices. What is the end result of a small amount of oil vs. increased energy costs, surface & subsurface equipment failures?

Fine Tuning

1. What is the pump-up time?
2. How long is the unit down?
3. What is the resulting runtime?
4. Can downtime be automated (see POC manufacture manual).

To reduce the effect of pounding fluid;

- Reduce the cycles of on/off periods, by -
- Properly cycling runtime,
- Optimize pumping system,

- Which may include reducing reversals
- An additional step to reduce the effect of fluid pound is to; reduce the number of fluid pound violations seen by the controller. Don't be afraid to challenge old paradigms or philosophies. Is it necessary to have the common preset violations?

Some fluid pound is undetected. The POC is set to a minimum "on" time before the controller measures fluid pound (*see Figure 4*). When the system is oversized for current inflow, the result could be the system pounding fluid in an undetected mode. This may occur the entire time the controller is in "pump-up" mode.

What can be done:
1. Increase down time, allowing for more pump fillage- monitor fluid level
2. Decrease SPM or capacity, follow good optimization practices.
3. Increase run time, to result in decreased cycles per hour.
4. Reduce number of violations, pound as little as possible.

Fluid Pound Impact Force

Based on the formula presented by Juch and Watson, the impact placed on the pump in the event of fluid pound can be calculated. Answers can be given as to why some systems can pound fluid and not have the same devastating effect as other systems. The table below (*see Figure 5*) computes the impact force based on the information entered for SPM, stroke, plunger diameter and specific gravity of the liquid.

How to use the Fluid Pound Calculator spreadsheet

1. Enter the *time off* and *runtime percent* in the "Existing" cell areas.
2. After noting the existing cycles and determining required needs, enter *time off* and *runtime percent* in the "Proposed" cell areas.
3. If Failure Ratio is not known, Enter into "Pull Frequency" area; the Date of Last Pull. The result will be the number of days/years since pull and Failure Ratio based on recent activity.
4. Resulting effect should be:
    5. Reduction in Fluid Pounds per year.
    6. Calculation of extended life of rod pump system.
    7. Reduction in Failure Ratio.
    8. Performance Increase.

NOTE: Listed In the Fluid Pound Calculator are things to do and not to do in order to reduce Fluid Pounds.

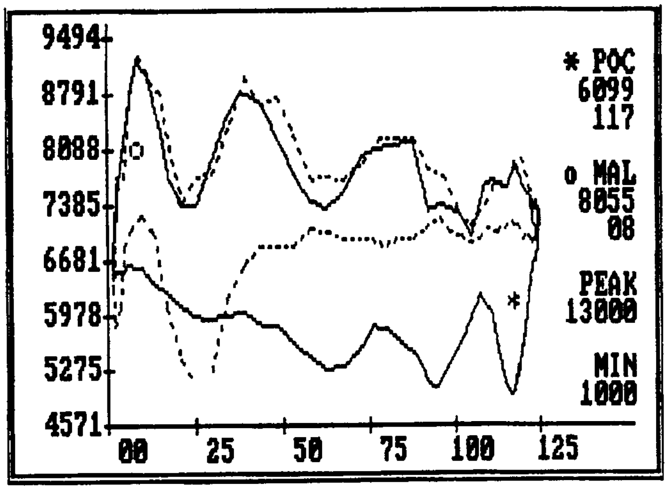

Figure 1

Case 1: Existing				
Time on	6.68	Cycle time		9.68
Time off	3	Cycle\hr		6.20
% run time	69%	Cycle\day		148.8
		Fluid pound violations	2	297.6
		Fluid pounds\yr		108624

Case 2: Proposed				
Time on	14.22	Cycle time		22.22
Time off	8	Cycle\hr		2.70
% run time	64%	Cycle\day		64.8
		Fluid pound violations	2	129.6
		Fluid pounds\yr		47304

Fld pds saved	61326
Extended life	2.30
Failure ratio	0.85
Forecast ratio	0.37
Fails @ pound #	127205
Performance increase	[illegible]

Pull Frequency	
Today	1/27/1999
Last pull	11/26/1997
# Days	427
Years	1.17
Pull Freq.	0.85

Days	[illegible]
Years	2.69

Production Data	
Stroke	144
SPM	8.25
Pump Size	2.25
Bbls\day	702
Bbl\stroke	0.059
Oil Cut %	2.4%
Net Oil	0.00142
Stks\Bbl	705
Min\Bbl	85.5

[illegible]	[illegible]
1. Increasing down time	1. Decrease down time*
2. Decreasing SPM or capacity	2. Increase SPM
3. Increasing cycle time	3. Decrease run time
4. Reducing number of violations	4. Increase no. of violations

* Depends on fluid inflow

Figure 2

Production Data	
Stroke	144
SPM	8.25
Pump Size	2.25
Bbls\day	702
Bbl\stroke	0.059
Oil Cut %	2.4%
Net Oil	0.00142
Stks\Bbl	705
Min\Bbl	85.5

Figure 3

Down time	On time	Cycle time	Ontime min
1	67%	3.00	2.00
2	50%	4.00	2.00
3	40%	5.00	2.00
4	33%	6.00	2.00
5	29%	7.00	2.00
6	25%	8.00	2.00
7	22%	9.00	2.00
8	20%	10.00	2.00
9	18%	11.00	2.00
10	17%	12.00	2.00
11	15%	13.00	2.00
12	14%	14.00	2.00
13	13%	15.00	2.00
14	13%	16.00	2.00
15	12%	17.00	2.00

Figure 4

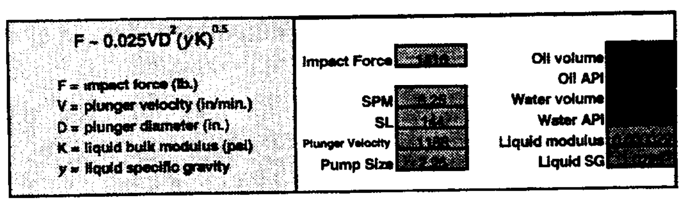

Figure 5