
Case History 2.4

PentaFlow + Pyrosol ES: Injector Recovery

- **New Drill - Water Injector**
 - **Moderate temperature (148°F)**
 - **Sulphide Matter and Biological Grunge**
 - **Bull Head**
-

This well was a side track from an existing injector which had dropped off injectivity quite rapidly in 2003. The sidetrack used a non-damaging water based drill-in fluid weighted with carbonate. Upon completion, injection was poor with high back pressure and little injectivity. Subsequent HCL and HF jobs did nothing to improve the well. Pulsonics were run in an attempt to clean it up but nothing was achieved. Flow back of the well revealed viscous black grunge from the well bore.

It was determined that the well was placed back into the area of the previous injector – where a bacterial biomass had been created previously and sulphide scale had built up substantially. As such a treating regime of PentaFlow – to break through the hydrocarbon and biological complex coating the near well bore, followed by Pyrosol ES which would operate on the exposed sulphide matter remaining.

The operation entailed stage placement of the PentaFlow near the well bore for 90 minutes then displacing the Pyrosol ES into the screens and near well bore.

The drop in pump pressure when the PentaFlow reached the formation (this is common) was very dramatic with the well taking fluid at an extreme rate. This weakening of the back pressure became more marked as the operation continued.

After 24 hours when placed on injection, the well took 50,000 bwpd – from 9,000 bpd previously. This tapered off to 35,000 bpd.

It was learned later that the well had been used to feed a nitrate into the reservoir in an attempt to sweeten sour crude in an adjacent producer. This was found to cause more complications later on but certainly explained the initial problems seen on this well.

**Case History 2.7 – February 2009
UKCNS**

PentaFlow – Pipe Release Case History ConocoPhillips

- **Oil Based Mud**
 - **6” Open Hole**
 - **Drill String Stuck at 18000’+**
-

*The drilling string became stuck during drilling operations at 18,196’. The well did experience minor fluid losses during the event and the drill string was worked whilst waiting for the **PentaFlow** to arrive on board. Although the string was jarred and worked during the delay, no evidence of the pipe coming free was seen.*

After becoming stuck the **PentaFlow** was ordered out to the location. Once on location, a 60 bbl pill of **PentaFlow** was prepared and pumped ahead of a base oil spacer. When **PentaFlow** made contact with the formation, it was noted that the losses increase slightly.

The string was jarred and rotation became possible shortly after the contact with the **PentaFlow**. The string jarred free shortly thereafter and was pulled successfully without any renewed sticking incidence.

The contact time from the first **PentaFlow** contact to the string being freed was under three hours.

Reference: Allan Cameron Allan.Cameron@contractor.conocophillips.com

Case History 4.3
ESP Cleaning : Maxus/YPF/Repsol Indonesia: Teresia AC6
PentaFlow + Pyrosol ES

- **ESP Scale : Sulfide + Formation + Corrosion**
 - **Deviated**
 - **Conventional Perforated Liner**
 - **Formation Stimulation**
-

*Summary: The ESP in Teresia AC-6 regularly trips from shale/scale build-up and normally requires pump replacement. Cleaning with the **PentaFlow** and **Pyrosol ES** regime needed only 21.5 hours to put the well back on production with no overload on the ESP. The formation was also unexpectedly stimulated when it **more than doubled the oil production**, resulting in a **payback time of 31 hours**.*

Maxus (YPF Repsol) Indonesia has chronic problems with the build-up of short term shale/scale deposits in their down hole electrical submersible pumps (ESP) in a number of fields. The pumps typically can reach overload in less than 30 days or can last 300 days (or more) of production life if chemical cleaning is successful. More often than not, it has been necessary to pull the pumps completely and replace them.

The debris on the actual pumps was examined, and concluded that the length of time a pump had been exposed down hole determined the type of treatment required to clean the pumps and remove the blockage debris.

In this approach, two distinct treatment regimes were programmed. The first was for pumps designated as “younger” or having been in place less than 180 days, with the second type designated as “older” which had been in service continuously or otherwise for much longer than 180 days.

The Teresia AC-6 ESP had been in service for 211 days producing between **150 to 175 bopd** when it went into over load and tripped out. Attempts to re-start the ESP were unsuccessful and no mechanical or electrical faults were noted. This well was noted for its high scaling potential and the tightness of the formation. It was suspected from previous pumps removed from this well that scale had built up between the diffuser and the impeller.

A treatment of 150 litres of **PentaFlow** was programmed for spotting across the pump in a single 90-minute soak as a pre-cleaning solution. The second stage entailed placing 155 gallons of **Pyrosol ES**, a high performance sulphide and carbonate scale dissolver, across the pump and allowing it to soak for 8 hours. After 8 hours, the **Pyrosol ES** was displaced to 155 gallons of fresh **Pyrosol ES** and the well shut in for 12 hours. **PentaFlow** and **Pyrosol ES** are non-corrosive.

After a total treatment period 21.5 hours, the pump was engaged and operating at full potential without tripping. After seven hours of start up, the well began producing 175 BOPD with no over load on the ESP, cleaning up to **396 bopd** after 36 hours of

continuous production and then levelling to **300 bopd**. The payback time was 31 hours but more importantly, the pump did not require replacement.

BEFORE : Typical ESP impeller and diffuser – pulled due to scaling.



AFTER : The same components as above after cleaning with PentaFlow and Pyrosol ES .



References: Robbie Soekama – Maxus Production Technology
rsoekama@notes.maxus.com

Eddie Suparti Yusuf – Maxus Production Engineering
eyusuf@notes.maxus.com

Case History 4.4
ESP Cleaning : Maxus/YPF/Repsol Indonesia: Zelda AC-1
PentaFlow + Pyrosol ES

- **ESP Scale : Sulfide + Formation + Corrosion**
 - **Deviated**
 - **Conventional Perforated Liner**
 - **Formation Stimulation**
-

*Summary: The ESP in Zelda AC-1 went into overload losing production of between 279 to 387 bopd. The well as treated with **PentaFlow** and **Pyrosol ES** with the chemicals left in the well bore after verifying the restoration of the ESP function. The tubing was pulled and replaced, leaving the **PentaFlow** and **Pyrosol ES** spotted across the perforations during this period. On re-running the tubing, with the original ESP, production was found to have increased to **1046 BOPD – a 300% increase**.*

CNOOC Indonesia (formerly Maxus YPF Repsol) has chronic problems with the build-up of short term shale/scale deposits in their down hole electrical submersible pumps (ESP) in a number of fields. The pumps typically can reach overload in less than 30 days or can last 300 days (or more) of production life if chemical cleaning is successful. More often than not, it has been necessary to pull the pumps completely and replace them.

The debris from the actual pumps was examined, and concluded that the length of time a pump had been exposed down hole determined the type of treatment required to clean the pumps and remove the blockage debris.

In this approach, two distinct treatment regimes were programmed. The first was for pumps designated as “younger” or having been in place less than 180 days, with the second type designated as “older” which had been in service continuously or otherwise for much longer than 180 days.

The Zelda AC-1 well had been in service producing **279 BOPD** when it went into over load and tripped out. Its peak production had been in excess of **1000 BOPD in 1999** but has declined steadily since. The ESP on this well failed and attempts to re-start the ESP were unsuccessful and no mechanical or electrical faults were noted.

A treatment of 150 litres of **PentaFlow** was programmed for spotting across the pump in a single 90-minute soak as a pre-cleaning solution. The second stage entailed placing 155 gallons of **Pyrosol ES**, a high performance sulphide and carbonate scale dissolver, across the pump and allowing it to soak for 8 hours. After 8 hours, the Pyrosol ES was displaced to 155 gallons of fresh Pyrosol ES and the well shut in for 12 hours. **PentaFlow + Pyrosol ES** are non-corrosive.

After a total treatment period 21.5 hours, the pump was engaged and operating at full potential without tripping. The pump was disengaged and the **Pyrosol ES** and

PentaFlow pumped back down through the pump and allowed to soak across the perforations. During this soak period, the ESP was pulled and the tubing replaced. After the intervention the well began producing **1046 BOPD** with no over load on the ESP, maintaining this production without decrease for over one month before this report was prepared and is still producing at that rate.

Case History 4.6

ESP Cleaning – Maxus/YPF/Repsol Indonesia: Farida A11 PentaFlow

- **ESP Scale : Sulphide + Formation + Corrosion**
 - **Deviated**
 - **Conventional Perforated Liner**
-

Summary : Maxus (YPF/Repsol) Indonesia has chronic problems with the buildup of short term shale/scale deposits in their down hole electrical (ESP) pumps in a number of fields. The pumps typically can reach overload in under 30 days, or can last as long as three hundred days or more of production life if chemical cleaning is successful. More often than not, it has been necessary to pull the pumps completely and replace them.

The debris from the actual pumps was examined and determined that the length of time a pump had been exposed down hole determined the type of treatment required to clean the pumps and remove the blockage debris.

In this approach two distinct treatment regimes were programmed. The first was for pumps designated as relatively “young” – or having been in place less than 180 days, with the second type designated as “older” which had been in service continuously or otherwise for much longer than 180 days.

The Farida A11 ESP had been in service less than 30 days producing **300 to 350 bopd** when it went into over load and tripped out. Attempts to re-start the ESP were unsuccessful and no mechanical or electrical faults were noted.

A treatment of 800 litres of **PentaFlow** was programmed to be spotted across the pump in two 45 minute soak stages. The first 400 litres was spotted above, through and just below the pump for 45 minutes, with the second stage used to flush the second through the pump and itself allowed to soak for 45 minutes. At the end of the full 90 minutes, the pump was engaged and the well brought onto production immediately. The pump has been producing **310 bopd** since the outset without any overload or tripping since the treatment over the twenty day observation period.

This was a highly successful operation demonstrating that the **PentaFlow** worked very efficiently and quickly in these younger pump blockages. **The payback time for the operation for the PentaFlow was 20 hours production time.**

References For **PentaFlow** Pump Cleaning:

Robbie Soekama – MAXUS Production Technology
rsoekama@notes.maxus.com

Eddie Suparti Yusuf – MAXUS Production Engineering
eyusuf@notes.maxus.com

Case History 4.7
OH-Perforation Cleaning –: Carbonate Reservoir Stimulation
CNOOC: Indonesia
PentaFlow

- **Carbonate Reservoir Stimulation**
 - **Acid Damaged**
 - **Weighted OBM Damage**
-

Summary :

*Summary: The Yani AC-1 well was unsuccessfully stimulated using HCL to cleanout the perforations after completion. Although no chemical explanation could determine what the incompatibility was exactly, the take was that the de-emulsifier and solvent package with the crude was incompatible downhole and the acid by products were in fact causing possible side carbonate liquefaction. **PentaFlow** was used as a last attempt to get the well to flow. Not only did it get the well to flow, but brought the well on stream at 20% more than the anticipated production of 3000 bpd.*

A treatment of 3150 litres of **PentaFlow** was programmed for bull heading into the well bore through the perfs and outward. The chemical was pumped and allowed to soak across the perfs – inside and out for 90 minutes, then displaced approximately 36” outward using fresh PentaFlow and water. After allowing to soak for 8 hours, the well was allowed to flow back and clean up on its own which was successful after 24 hours.

Parti Yusuf – Maxus Production Engineering eyusuf@notes.maxus.com

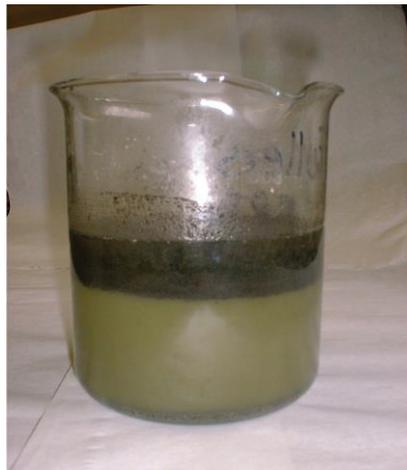
Case History 4.8

ESP Cleaning – Private Contractor For Pertamina Retrieved Pump – De-scaling Operation On Surface

- ESP Scale : Sulphide + Formation + Corrosion
 - Pump on Surface
-

Summary : *Summary: The rate of ESP failure in the fields off Indonesia are extremely high due to scale build up and formation solids plating out on the impellers. Although cleaning these downhole had been field proven with some Operators – others were still pulling ESP's and having them treated at surface. **PentaFlow** was used to soak the ESP's in a bath at ambient temperature to see if this could be done cost effectively. The pumps were soaked in an open tank of **PentaFlow** and allowed to soak overnight. The pumps were removed and proved to be in pristine condition .*

Photo of fluid removed from soak – note the oil separation from the dissolved scale and corrosion products below:



Typical Before & After Condition of ESPs Being Treated With *PentaFlow*