



Society of Petroleum Engineers



# Gas Field Development and Production – State of Play

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# **BUFFER PIPELINE UTILIZATION FOR CONTINUOUS FUEL GAS SYSTEM IN SLUG FLOW CONDITION**

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PHE ONWJ – Zona 5



# Background

4 NUI ACTIVES:

ZUA-ZUB-ZUD-ZUG

PRODUCTION:

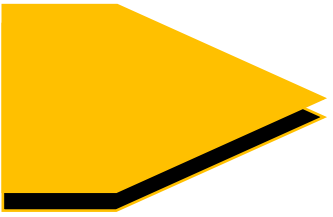
23 ESP WELLS

15K BFPD – 2.5K BOPD

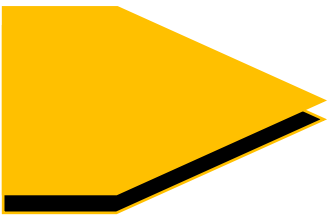
Export  
Line



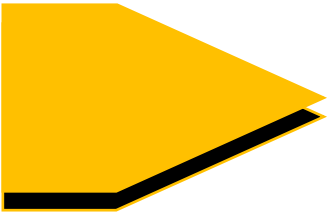
# Background



Production at the “Z” oil field uses ESP (Electric Submersible Pump) as artificial lifting. ESP requires a power supply in its operation. The electricity supply at “Z” Field is generated by a Turbine Generator Set (TGS) with **a certain fuel gas pressure** as supply.



Fuel gas pressure is achieved using compressors with associated gas separated by a production separator as a feed gas. So, **compressor performance and reliability** must be good to prevent unplanned shutdown



Produced hydrocarbon from a remote platform **flowing in 3-phase** form to our main processing platform. This 3-phase form leads to slug flow conditions at current flow rates, **as consequences pressure at the production separator fluctuates and creates unstable performance for the compressors**

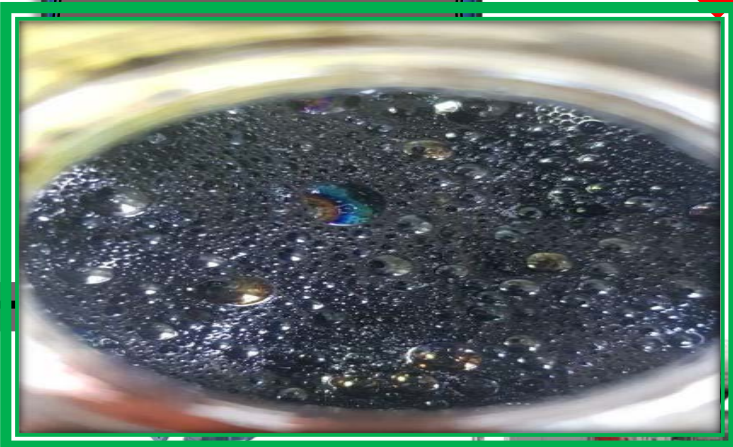
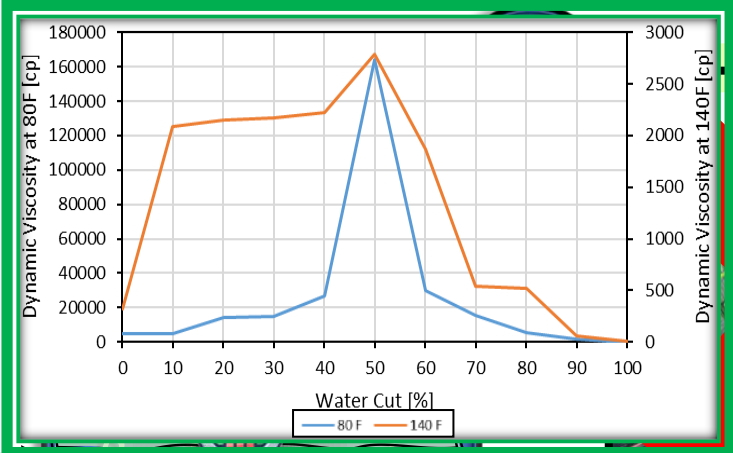


# Process Simplified Diagram

- High Viscous
- Heavy Oil API 18
- Foaming
- Rate < capacity pipeline

Slug flow

From Wells (3 phase)



MOL Pump



Mini Compressor Package

HP Flare



Fuel Gas System

Export Line

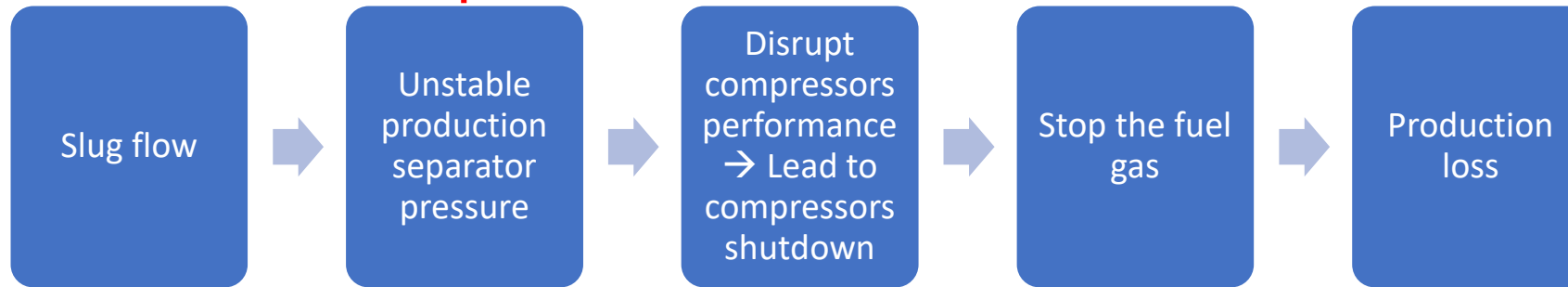
Turbine Generator Set



Prod. Header



# Problem Statement & Analysis



• **Unstable suction:**

- Can be stabilized by injecting more gas from different sources directly into the suction header in low suction conditions. For high suction conditions overcome by existing pressure control valve

• **Fluid velocities:**

- Oil characteristic and current production profile is a given condition
- Piping re-sizing is too expensive and much effort

• **Low fuel gas pressure as indicator:**

- Can be stabilized by injecting high pressure gas from different sources directly into the Fuel gas system

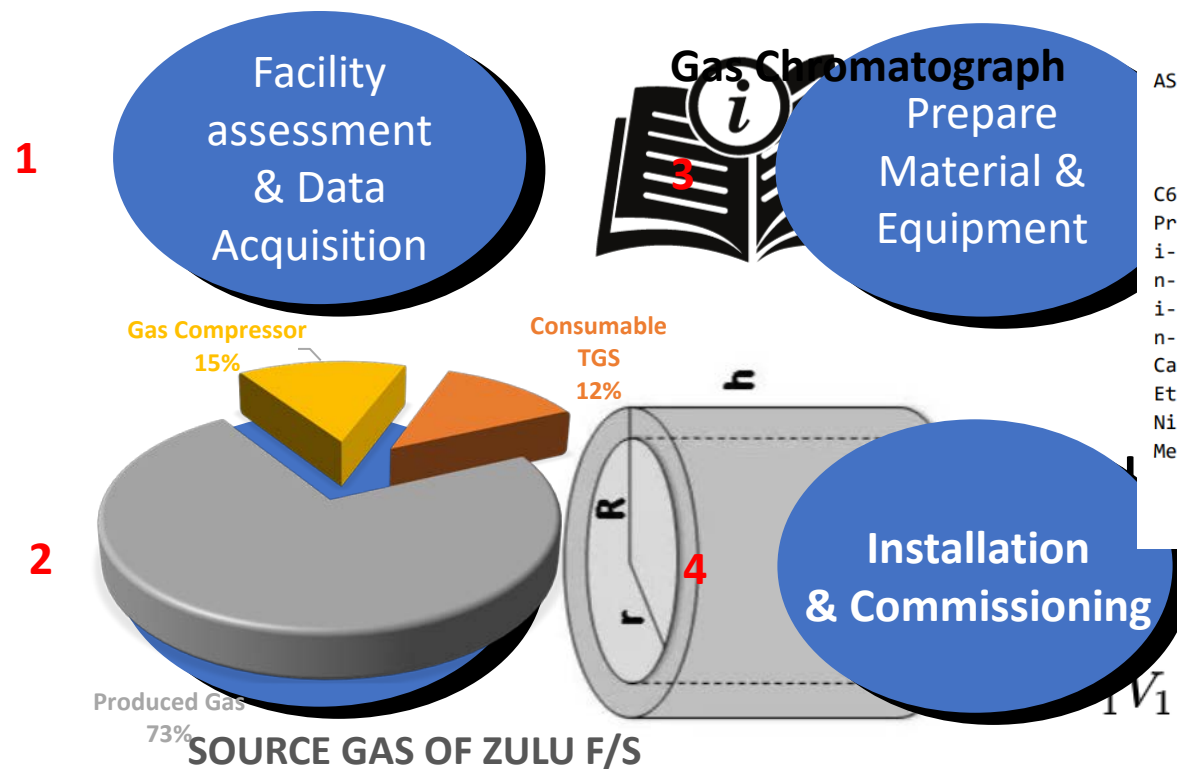
## POTENTIAL RESOURCES

- Several inactive wells still have **high pressure** on the casing and/or production tubing after being checked by the operations team.
- Good visual inspection on the inactive pipelines

# Solution & Methods

- Solution:**

Creates injection point from another source of gas into the suction of the compressors and fuel gas system. We called this “stabilizer” and can be operated in low pressure mode and high pressure mode



ASTM/GPA Calculation: Temperature 60°F Ideal values Base Pressure 14.69 psia.

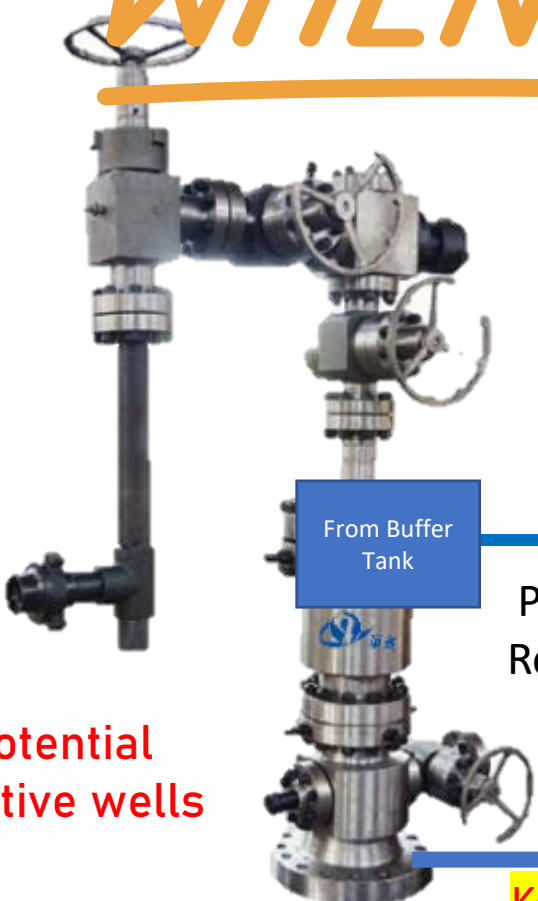
Compound	RT	Area	Wt%	Mole %	Sp.Gr.	Gross BTU/CF	Net BTU/CF
C6+	1.857	428.8	0.6021	0.1215	0.0036	5.7765	5.3488
Propane	4.294	1827.7	2.4277	0.9574	0.0146	24.0789	22.1544
i-Butane	5.640	364.6	0.5487	0.1642	0.0033	5.3372	4.9225
n-Butane	6.643	449.9	0.6701	0.2005	0.0040	6.5371	6.0339
i-Pentane	9.867	144.9	0.2370	0.0571	0.0014	2.2843	2.1122
n-Pentane	11.300	128.4	0.2090	0.0504	0.0013	2.0187	1.8663
Carbon Dioxide	14.414	1262.2	2.1144	0.8355	0.0127	0.0000	0.0000
Ethane	16.522	2489.8	2.8731	1.6616	0.0173	29.3926	26.8897
Nitrogen	18.494	70227.2	4.2053	2.6105	0.0252	0.0000	0.0000
Methane	19.177	1496.0	86.1127	93.3415	0.5170	942.3640	848.1276
Total					0.6004	1017.7892	917.4554

123 dari



# Low Pressure Mode Stabilizer diagram

## WHEN?



Potential Inactive wells

From Buffer Tank

Pressure Regulator

Pressure Header  
Compressor  
<20 Psi

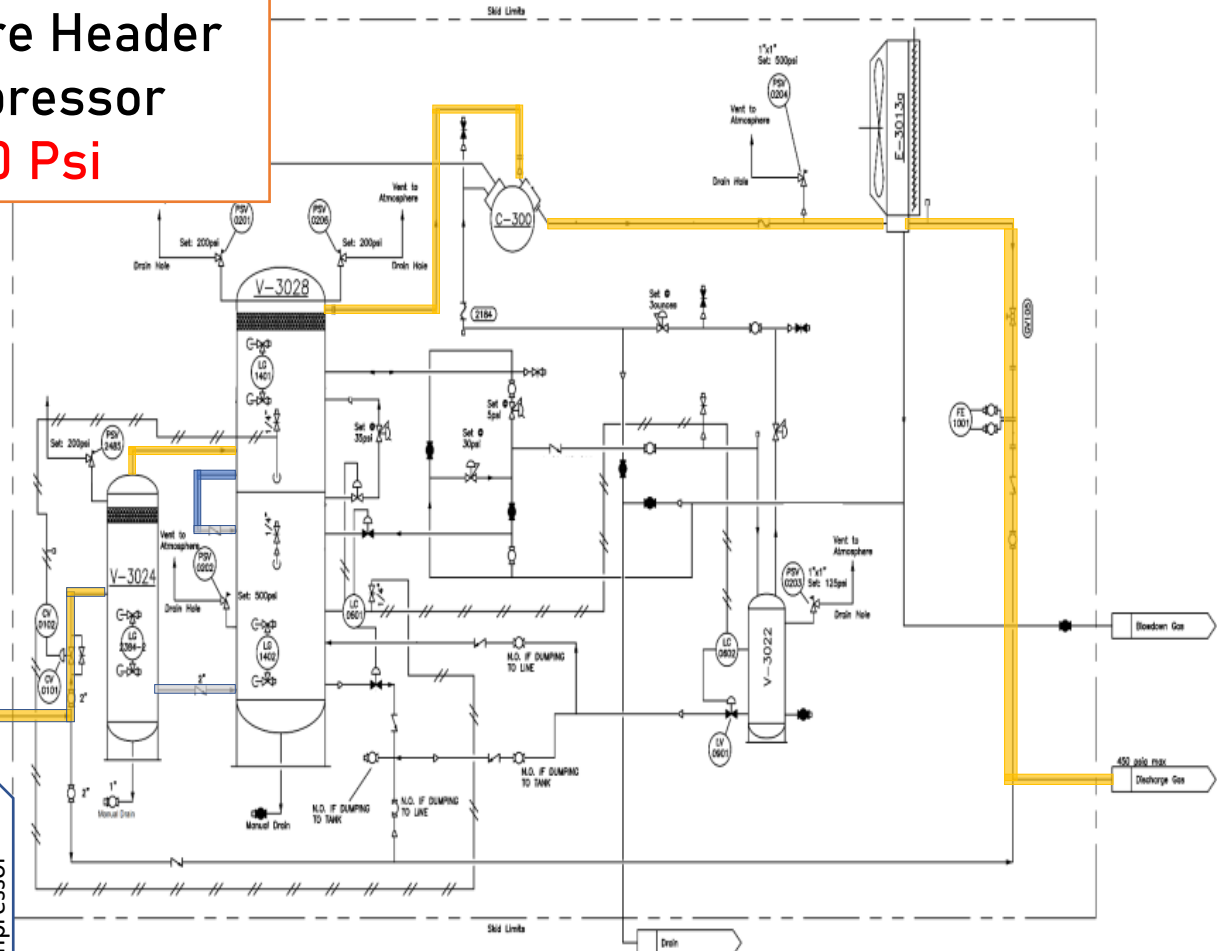
Pressure Controller

PT



Keep Pressure Gas  
240 Psiji

Header Suction  
Mini Compressor



Pipeline 12"  
Sch 40 900#



# High Pressure Mode

Compressors problem

Less Associated gas from wells

Package



FUEL GAS  
SCRUBBER

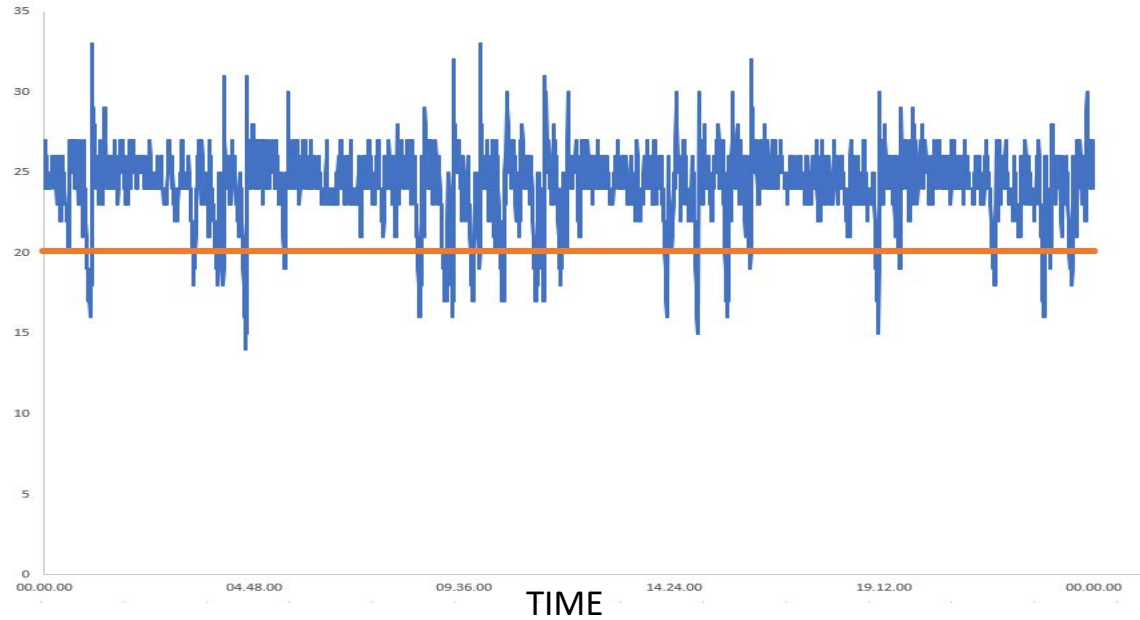
From Buffer Tank

Discharge  
Compressors

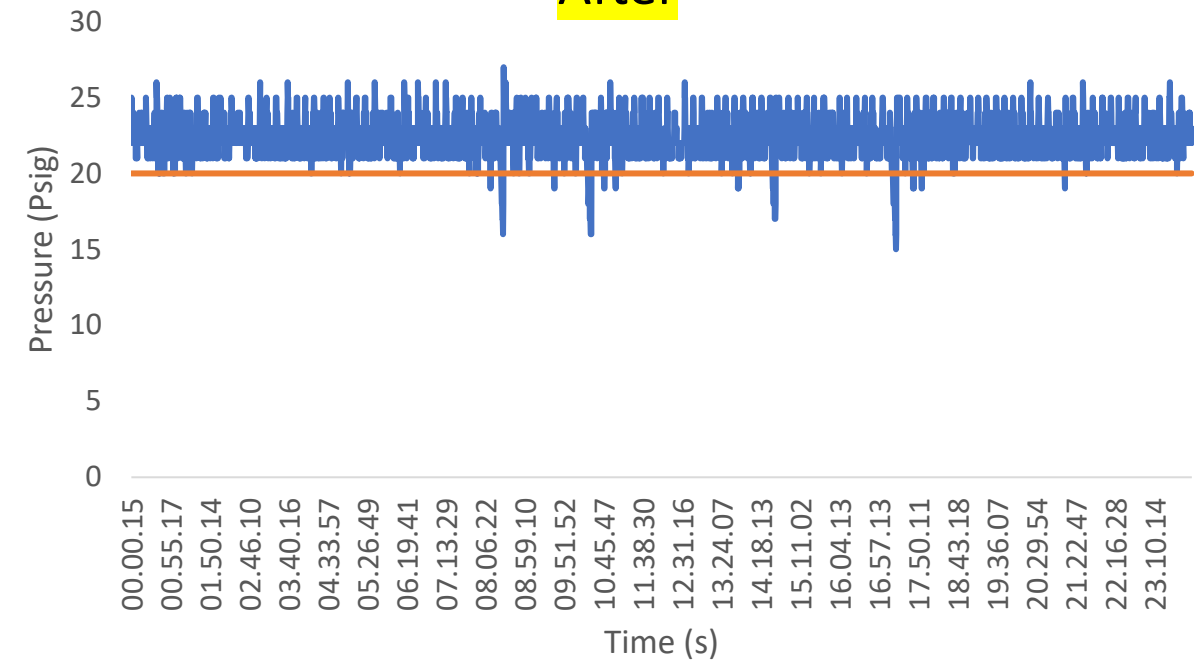


# Results

Before



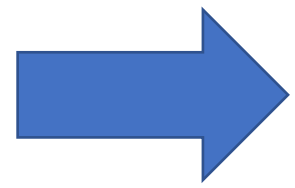
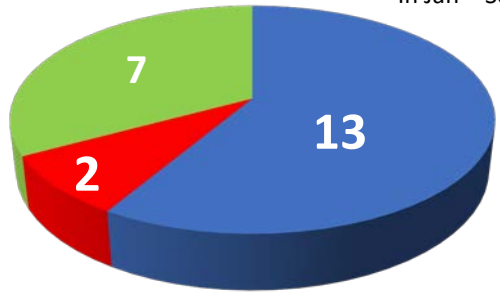
After



## Number of Failure Mini compressor

In Jan – Sep 2023

- Unit A
- Unit B
- Unit C



**0**

Event Failure from November – December 2023

## Gas Compressed

BEFORE	<b>645.2 MCFD</b>
AFTER	<b>673 MCFD</b>

## Conclusions

- Stabilizer can **overcome** the disadvantages of slug flow condition on compressors operation in Z working field
- Inactive facilities may **have potential** that can be used under any operating conditions and this potential can be used after appropriate assessments have been carried out