



Society of Petroleum Engineers



Gas Field Development and Production – State of Play

15 – 16 January 2024 | BANGKOK, THAILAND

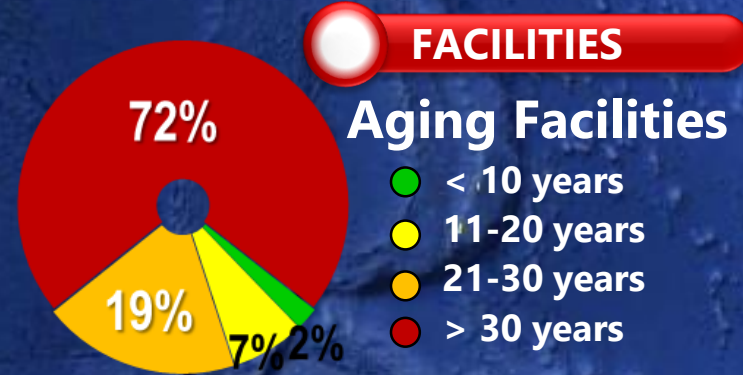
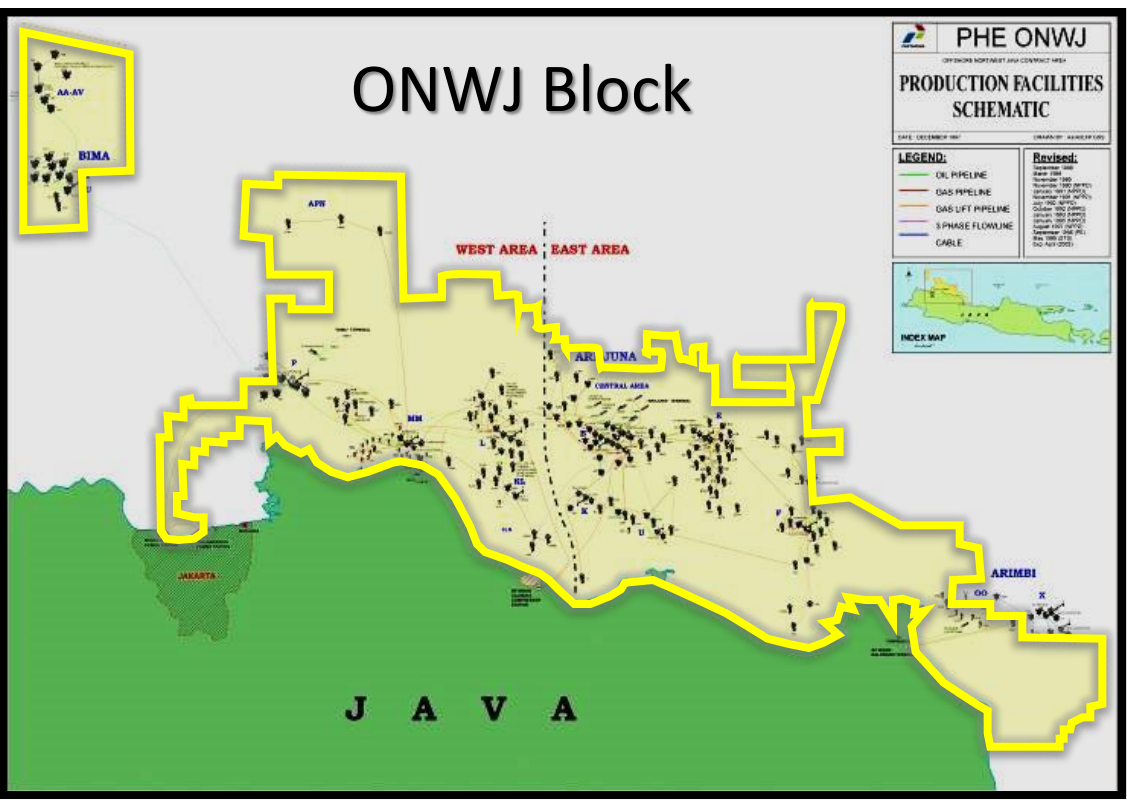
Increase Flow Assurance of 3-Phase Pipeline Using Venturi System of Ejector to Prevent Debottlenecking Issues

Arii Bowo YUDHAPRASETYA

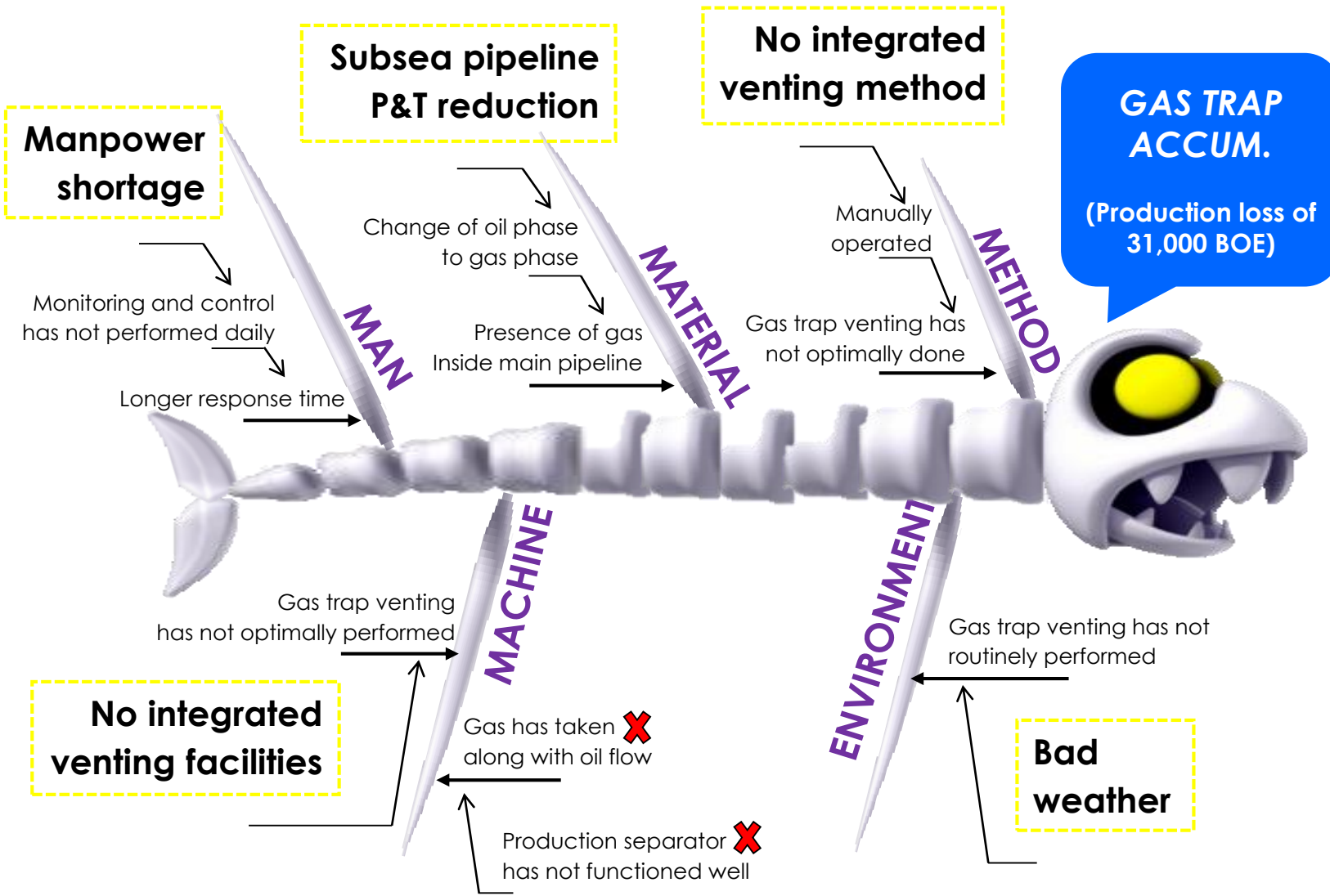
Pertamina Hulu Energi Offshore North West Java



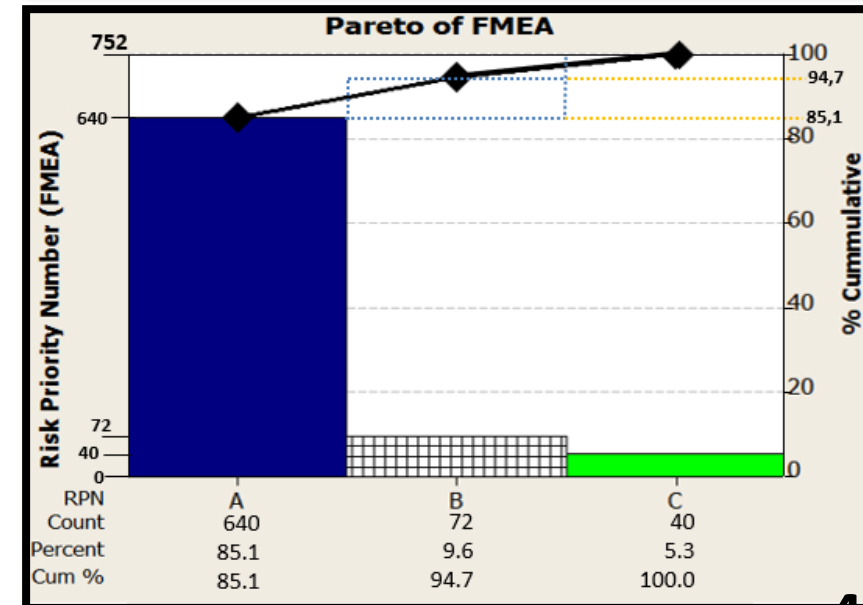
ONWJ Block



Fish Bone Diagram (Ishikawa)

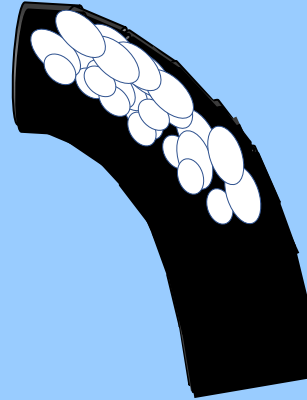


Process Description	Failure Mode	S	O	D	RPN
A	No proper gas trap venting method & device	8	10	8	640
B	Manpower shortage	8	9	1	72
C	Visiting limitation due to bad weather	8	5	1	40
TOTAL Risk Priority Number					752



Gas Trap Phenomenon

Gas Trap



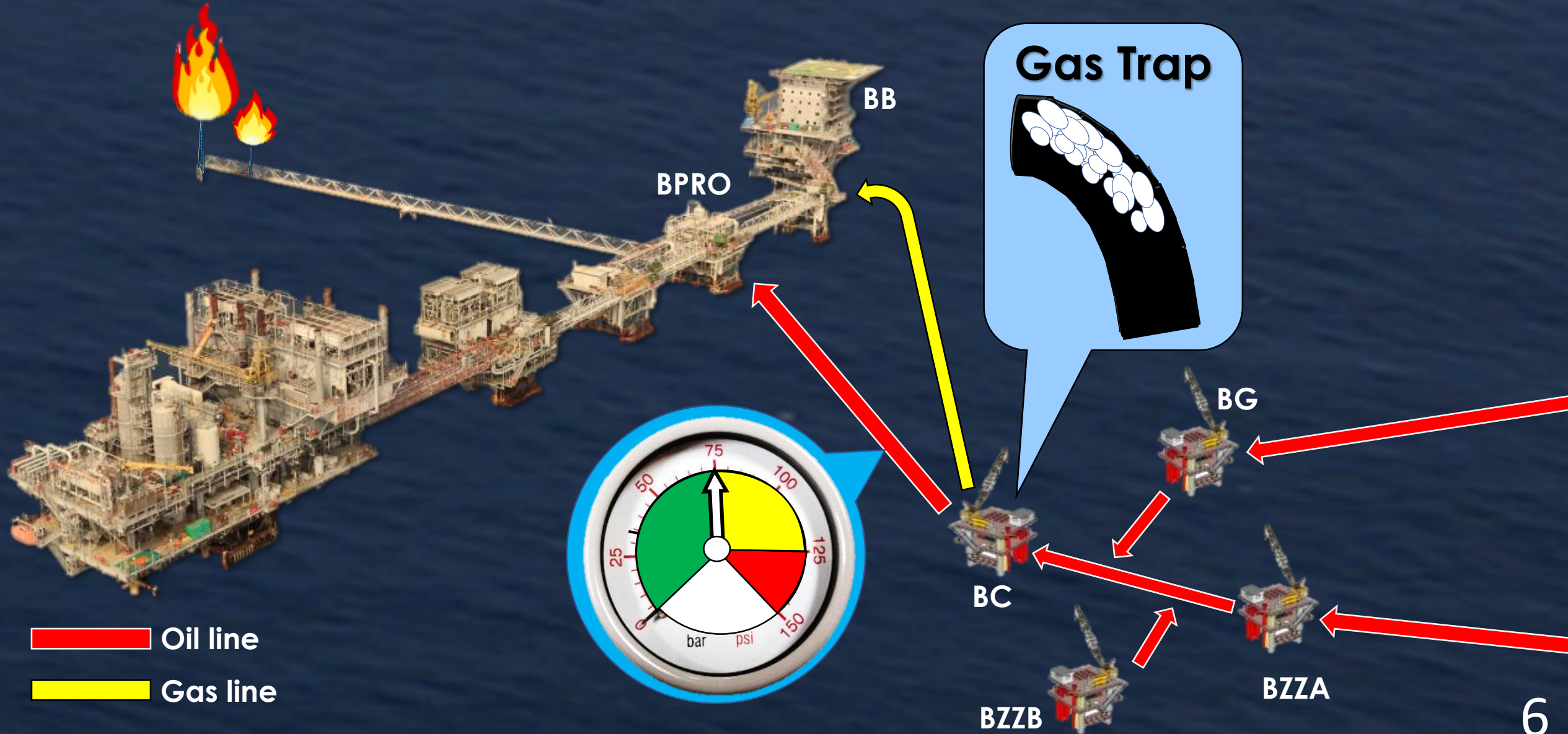
Gas trap accumulation

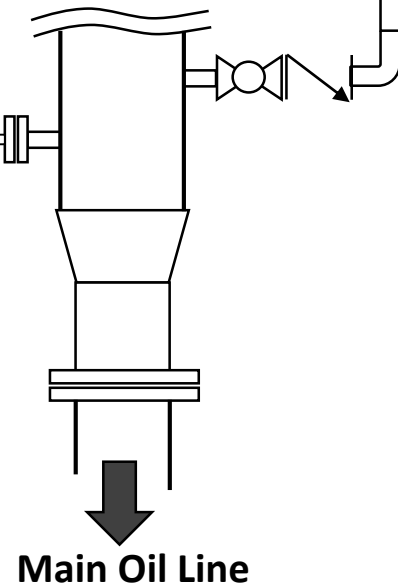
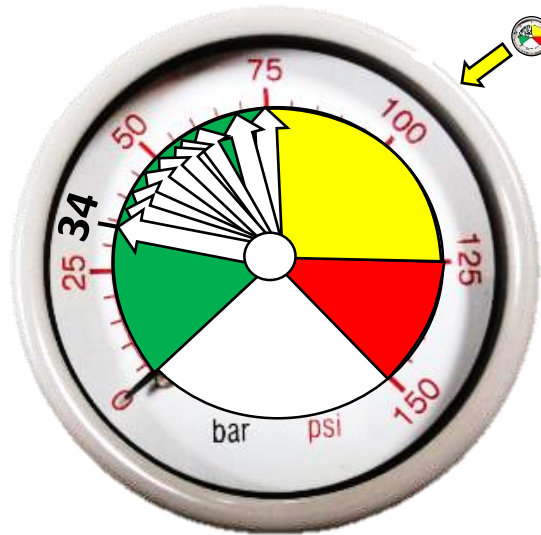
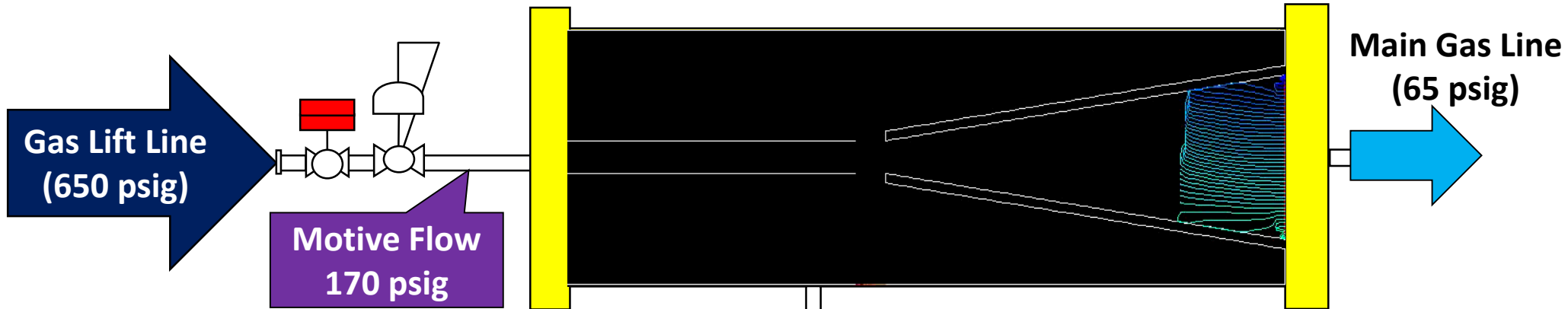
Pipeline bottlenecking issues

Limit production capacity

Emission

Pipeline Network





COMPUTATIONAL FLUID DYNAMICS SETTINGS

Viscous Model	K-epsilon & Standard wall functions
Solver	Pressure based & Green-gauss node based
Pressure-Velocity coupling	Semi-Implicit Method for Pressure-Linked Equations.
Discretization	Pressure Staggering Options (PRESTO) 2 nd order for Momentum & TKE 1 st order for Turbulent Dissipation Rate

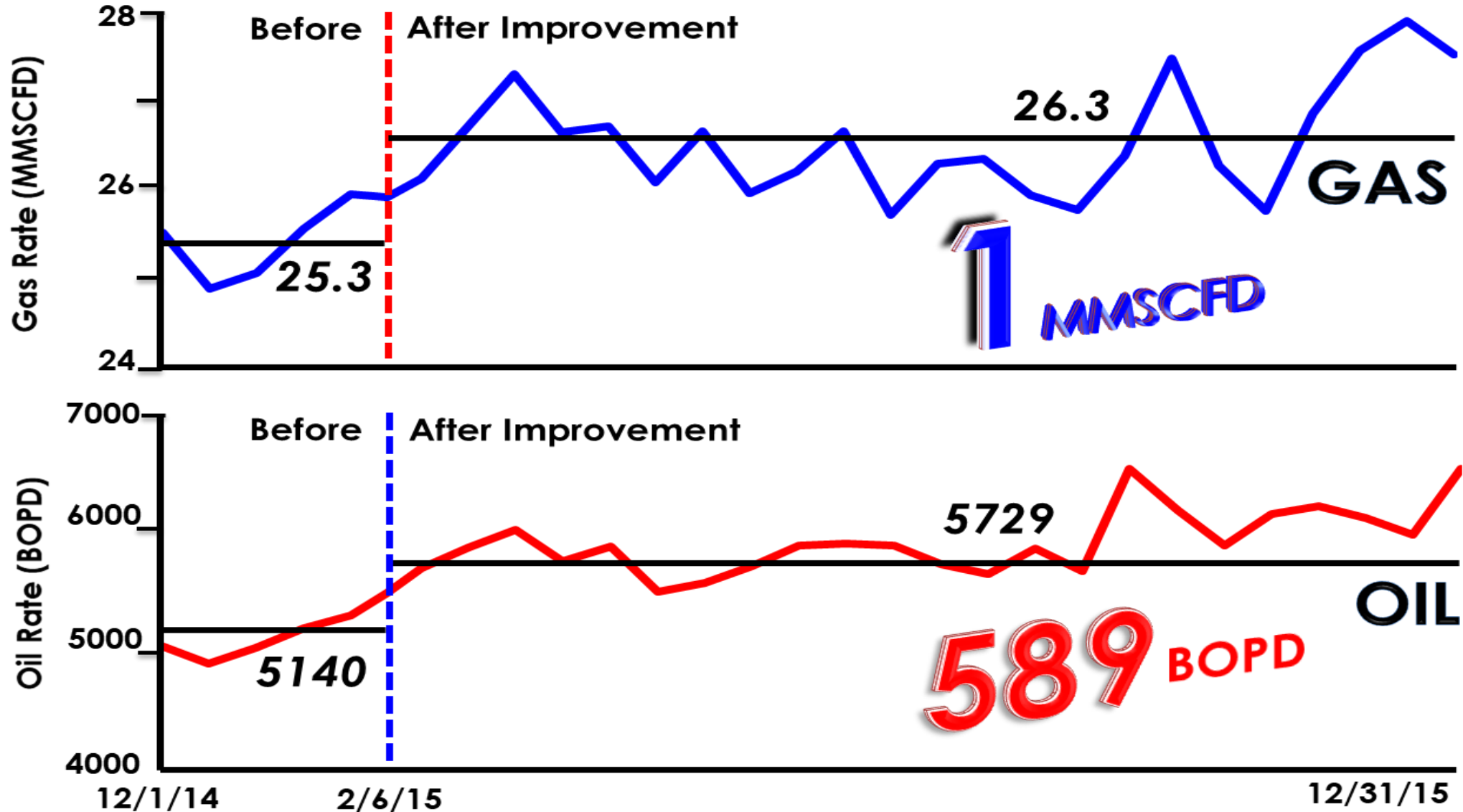
Syphon Effects

**Normally Unmanned
Installation BC Platform**

**Flow Obstacle
Vanished**

**Gas Trap Phenomenon
Vanished**

Full Year Results



1. A combination of **fish bone diagram and failure mode effect analysis** is sufficient being applied at the working field to determine any field issues
2. For fully turbulent flow, **k- ϵ and standard wall functions** model is simple, fast, and leads to a stable calculations for a reasonable several flow predictions.
3. Gas trapped along main oil line is **recovered effectively** using venturi system of ejector up to **1 MMSCFD**
4. Main oil line pipeline pressure is **optimized up to 34 PSIG** (before it was 75 PSIG). Slugging and debottlenecking pipeline issues are solved in a robust way. Production recovered up to **589 BOPD**
5. This solution could prevent any atmospheric venting activities which had been becoming an alternative approach to release any gas trapped accumulation along pipeline