



SEPTEMBER 2024

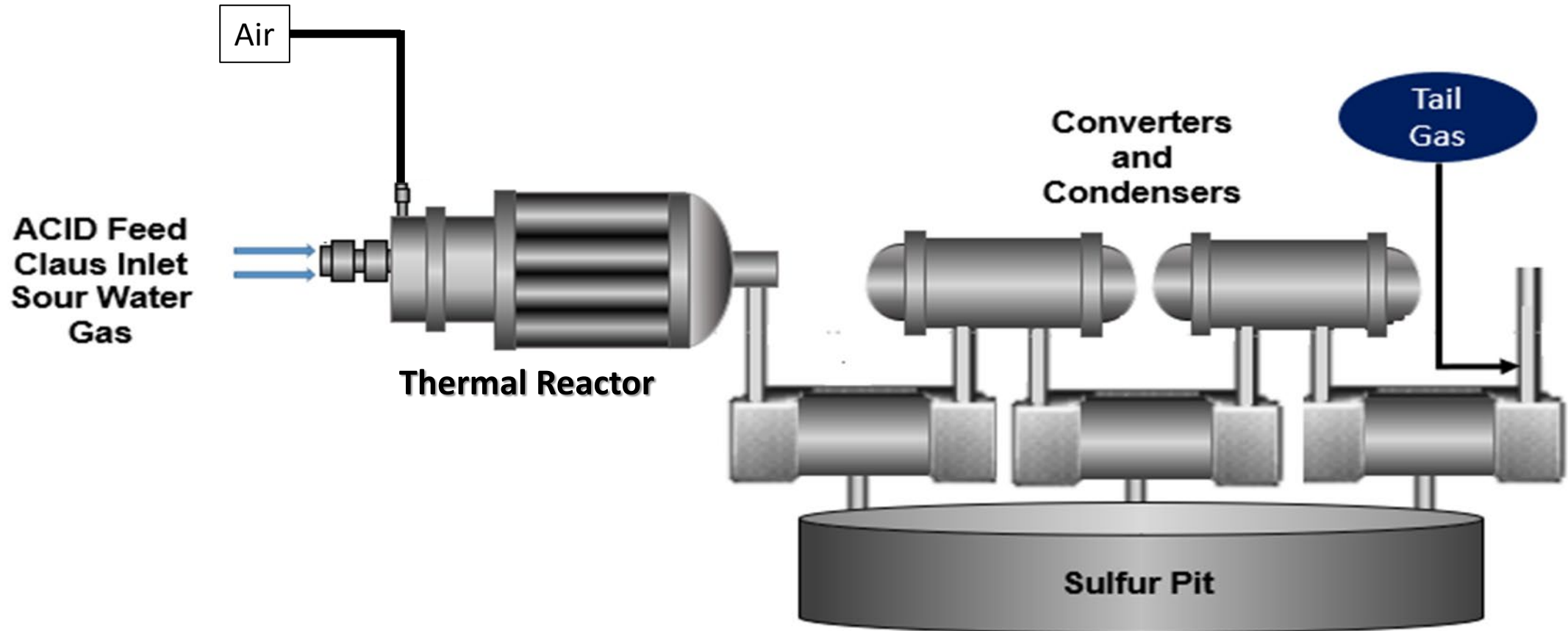
# SECOND GENERATION SRU FEED FORWARD CONTROL

ANALYZER AIR CONTROL TECHNOLOGY – 2ACT

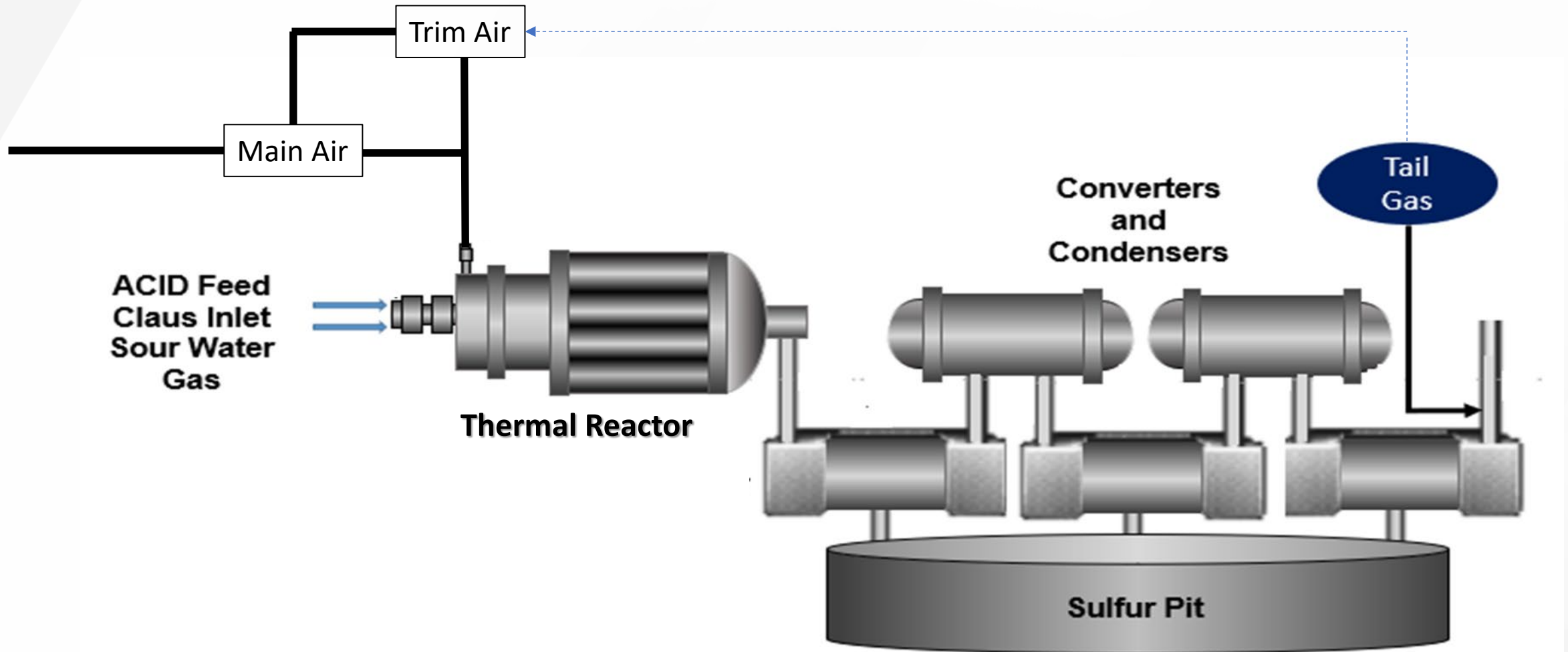
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## A LITTLE BACKGROUND

- It is estimated that 2000+ sulphur trains exist



## FEED BACK CONTROL

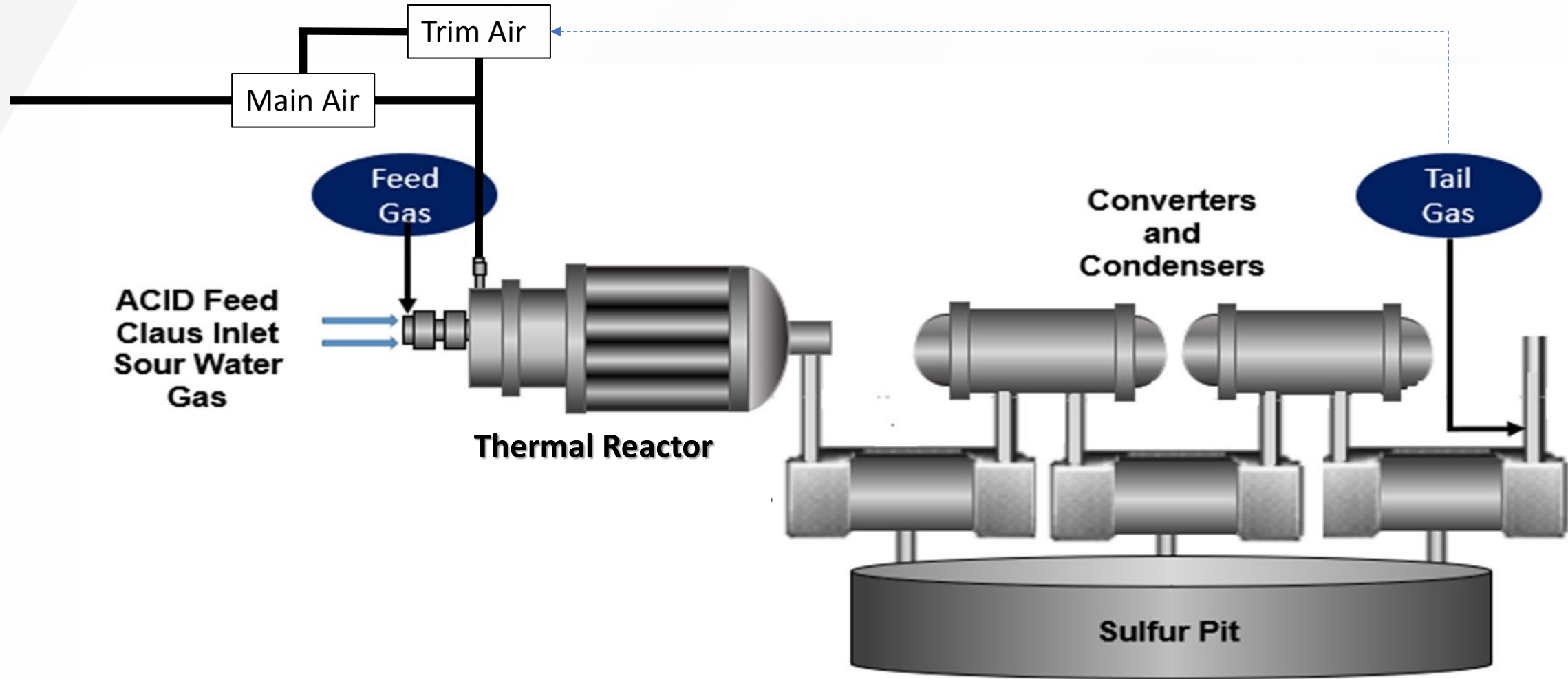


### O<sub>2</sub> REQUIRED TO BURN HYDROCARBONS COMPARED TO AN EQUAL AMOUNT OF H<sub>2</sub>S

| Compound | Moles O <sub>2</sub> per Mole HC | Ratio of O <sub>2</sub> needed per mole HC compared to mole of H <sub>2</sub> S |
|----------|----------------------------------|---|
| Methane  | 2                                | 4   |
| Ethane   | 3.5                              | 7   |
| Propane  | 5                                | 10  |
| Butane   | 6.5                              | 13  |
| Pentane  | 8                                | 16  |
| Hexane   | 9.5                              | 19  |

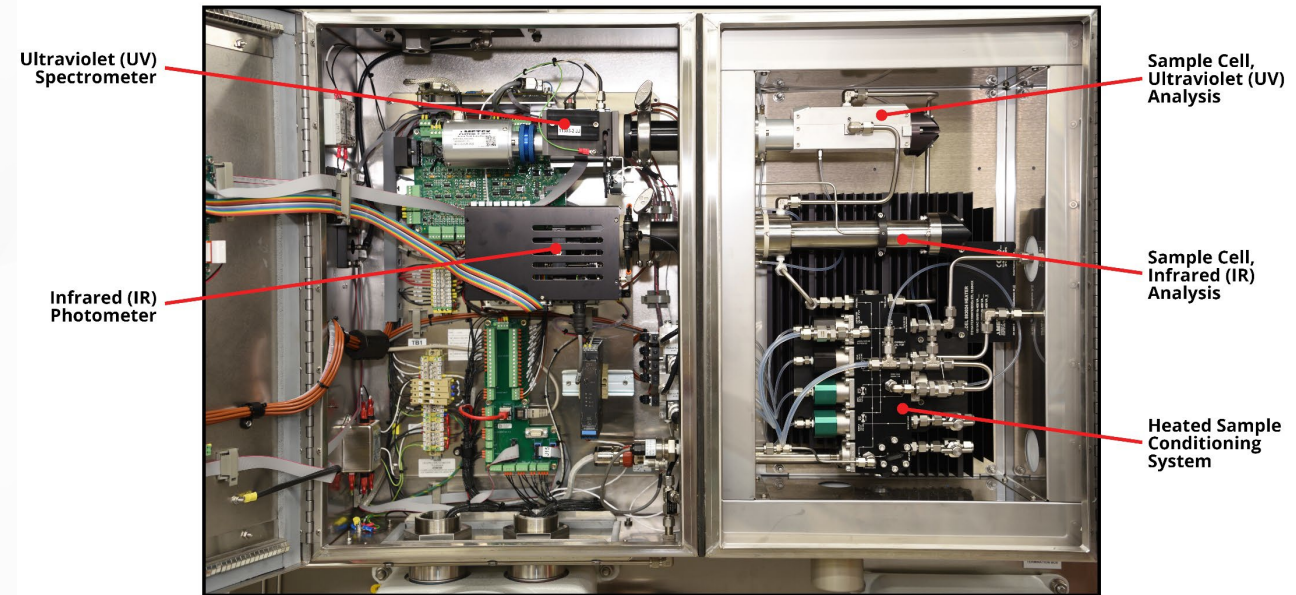


# INTRODUCTION OF FEED GAS MEASUREMENT



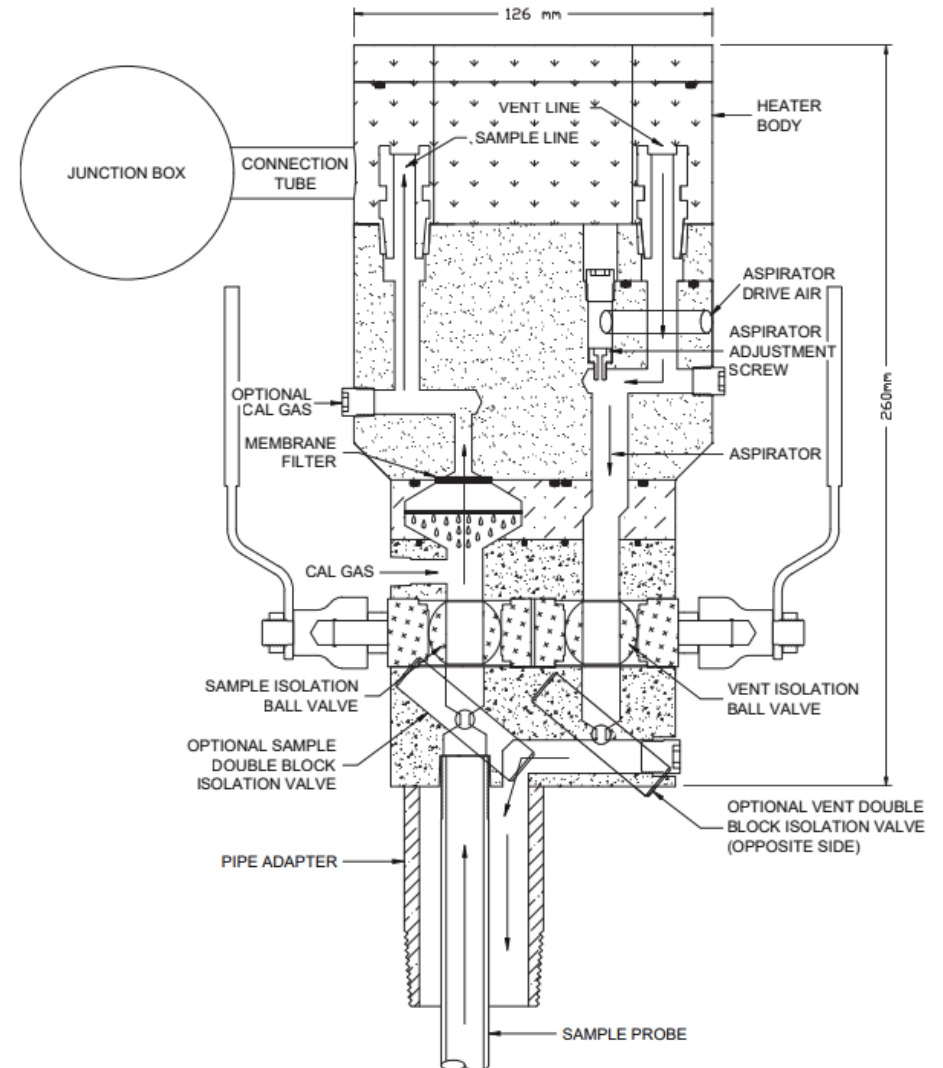
# HISTORY OF FEED FORWARD MEASUREMENTS

- Gas Chromatographs, FID, IR and Ultraviolet-based analyzers were all installed with varying degrees of success...or frustration
- AMETEK 9XX UV analyzers provided  $\text{H}_2\text{S}$  concentrations
- IPS-4 added the ability to measure  $\text{H}_2\text{S}$  and  $\text{CO}_2$ ,  $\text{NH}_3$ , THC and  $\text{H}_2\text{O}$
- Customers don't know that they can "CLOSE THE LOOP"
- A dozen or so did implement a complex scheme, with mixed results





# SIMPLIFIED SAMPLE HANDLING SYSTEM





# 2ACT™ Solution

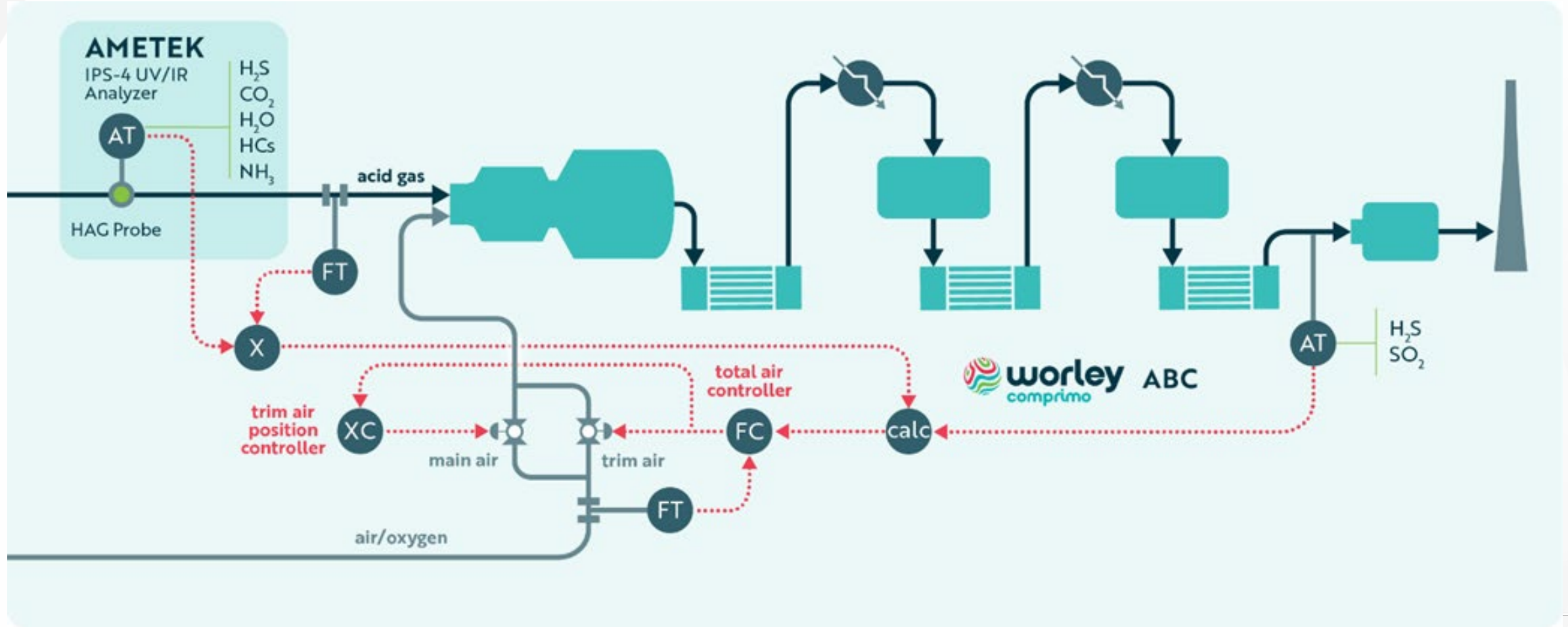
Analyzer Air Control Technology



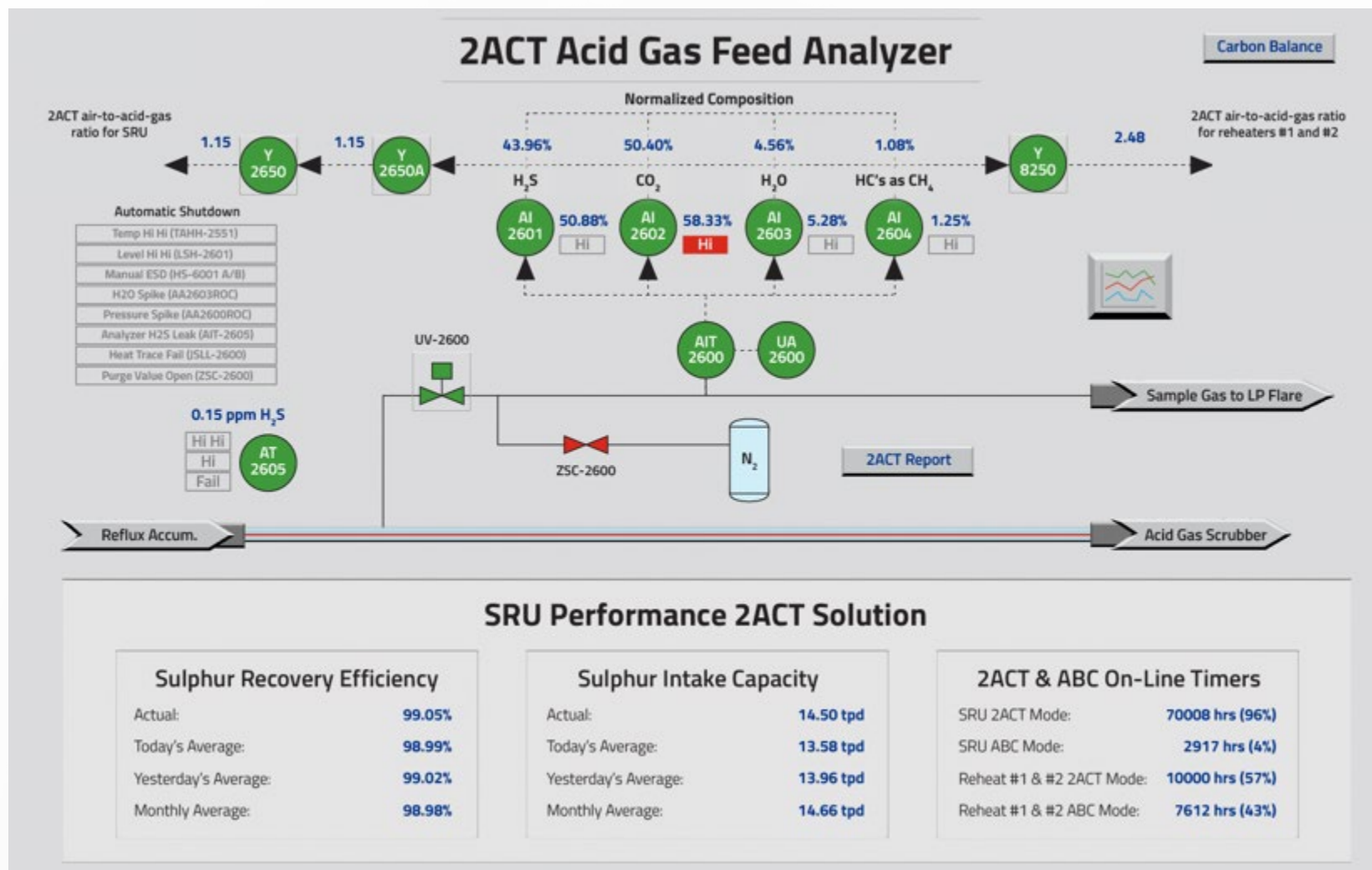
[worley.com/comprimo](http://worley.com/comprimo)



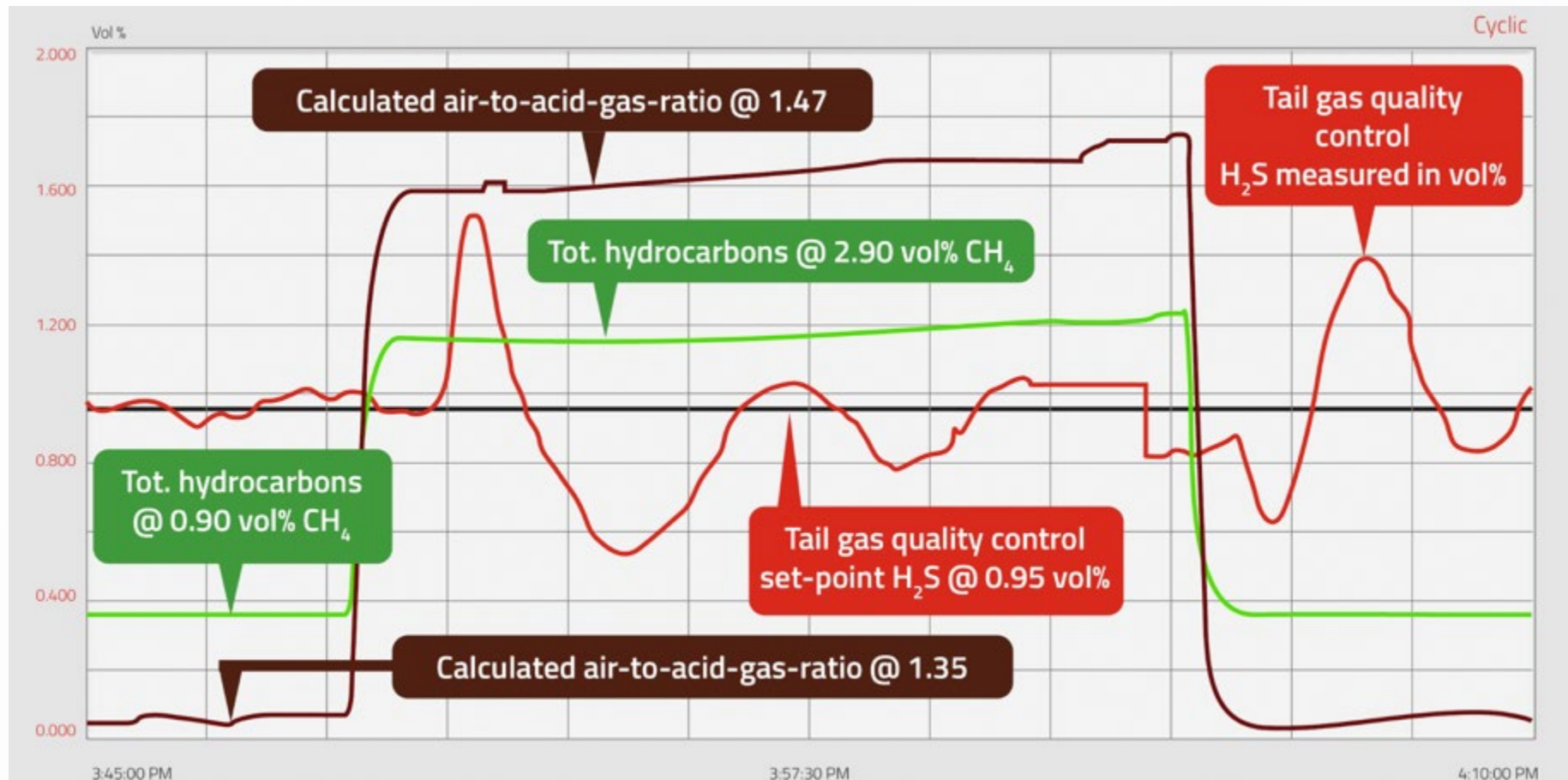
## 2ACT SOLUTION – AUTOMATICALLY REACT INSTANTLY TO CHANGES



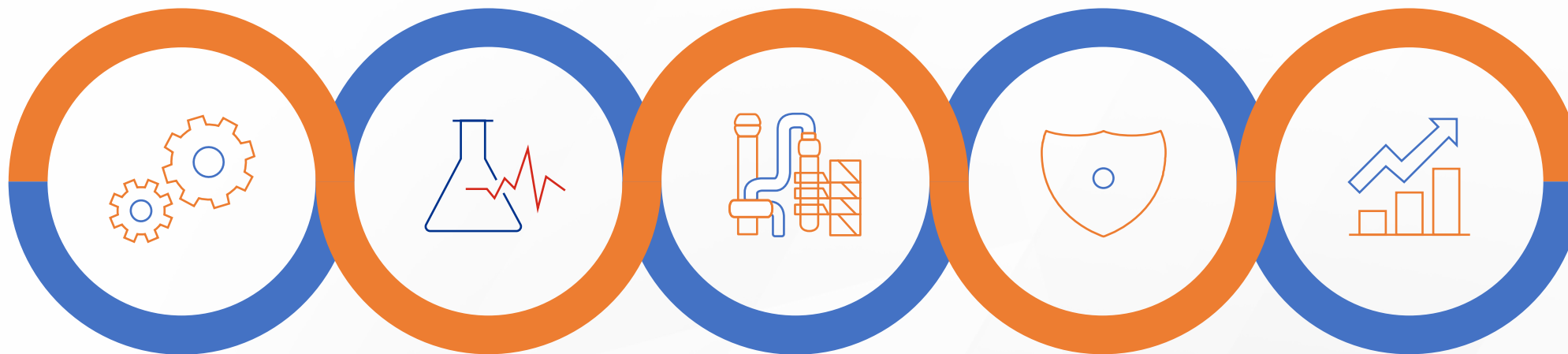
## 2ACT SOLUTION – DCS GRAPHIC



# HC CARRY-OVER UPSET WITH 2ACT SOLUTION



## KNOW WHAT IS IN YOUR SRU ACID GAS



### Act fast

Use the acid gas composition to automatically adjust the air demand to the thermal stage every second of the day.

### Evaluate

Continuously analyze the composition of the inlet stream to the SRU. This makes it possible to constantly calculate overall recovery efficiency and have an accurate sulphur balance.

### Upstream

Inlet composition can be used to detect upsets in upstream amine and sour water stripper units which allows for troubleshooting and optimization.

### Protect

Ensure an adequate air flow to the thermal stage at all times and prevent unnecessary downtime and unit bypass scenarios. This will protect equipment and reduce emissions.

### Recovery

Improve the SRU recovery by keeping your plant closer to the optimum setpoint, even when the inlet composition fluctuates.





## 2ACT SOLUTION – BENEFITS

- Reduce your SO<sub>2</sub> emissions and carbon footprint
- Rapid return on investment
- Prevent SRU incinerator stack regulatory violations
- Prevent unplanned downtime or reduced throughput
- Less operator intervention required
- Safer, easier and faster SRU startup
- Complete solution with low implementation costs





## VALUE FOR PLANT LOCATION

- Improve sulphur recovery by 0.1%-0.2% (avg.)\*
- Reduce SO<sub>2</sub> emissions by 0.2-0.4 tpd (avg.)\*
- Prevent upsets and associated emission and stack-top-temperature regulatory violations
- Reduce downtime and flaring
- TGTU catalyst and amine protection
- Minimize/eliminate operator intervention
- Reduce soot formation during hydrocarbon (HC) carry-over
- Operate closer to nameplate capacity
- Improve measurement accuracy of CO<sub>2</sub> balance, sulphur balance, on-line sulphur recovery efficiency and acid gas flow (with molecular-weight-compensation)
- On-line thermal reactor temperature prediction (Comprimo TEMPROTECT)
- Preventing one upset that results in reduced gas plant/refinery throughput = immediate return on investment





## 2ACT SOLUTION – EMISSION REDUCTION & SMALLER CARBON FOOTPRINT

- Very stable control, higher efficiency, lower emissions
- Fewer upsets, less downtime
- Fewer shutdowns and start-ups
- Reduced time to bring SRU online
- Lower SO<sub>2</sub> emissions – through increased SRE, as well as higher time on stream
- Reduced natural gas/fuel gas firing
- Reduced CO<sub>2</sub> emissions





## 2ACT SOLUTION – ENERGY TRANSITION

- Co-processing renewables and changing acid gas feed composition
- SRU sulphur and carbon balance and monitoring options
- Optimized operation/high efficiency – reduction of emissions
- Reduction in energy use and carbon footprint





## WHY AMETEK

- 40+ years of analyzer experience in SRUs (legacy Bovar, Western Research and Dupont)
- Nearly 2,500 tail gas analyzers (air demand analyzers) shipped to end users
- Built for purpose gas analyzers
  - Models 700, 900, 9xx, 4xxx, 880, 888, 888L
- Over 1,000 analyzers measuring component concentrations in feed gas, sulphur pit, tail gas treatment and stack emissions
  - Models 7xx, 9xx, 4xxx, 881, IPS-4
- Full system integration experience providing:
  - Probes
  - Walk-in shelters
  - 3-sided enclosures





## WHY COMPRIMO

- 65+ years experience and largest SRU technology provider: 1200 licensed units globally (legacy Jacobs and WorleyParsons)
- Global reach with offices in USA, Canada, UK, the Netherlands
- 80+ dedicated, specialized and experienced process engineers focused on sulphur recovery
- Comprimo is part of the Technology Solutions Business Unit of the Worley – EPCFM organization
- Decades of experience in SRU air control system design, implementation, commissioning and start-up
- One-stop-shop from project kick-off to commissioning and start-up





## 2ACT SOLUTION – SUMMARY

- Combination of AMETEK IPS-4 and Comprimo ABC at relatively low cost provides the SRU industry with a very robust air control system
- In the world of energy transition, biofuels, renewables and carbon footprint reduction, the 2ACT Solution will reduce carbon and sulphur emissions
- Manage feed compositional changes, maintain stable operation, lower emissions and prevent refinery/gas plant downtime/reduced throughput
- ROI: preventing 1-day SRU downtime/upset
- Additional features: accurate thermal reactor temperature prediction, MW compensated flow rate, sulphur balance and allows upstream troubleshooting

