



# Digitalisation of Process Expertise

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# Control room operator challenges

- **40 000+** configured alarms
- **500+** displays
- **More** information channels

- Number of control room operators



Open Alarm Viewer

Home Refresh Help Exit JAVED (Role)

Acknowledge Global Ack Delete Delete All

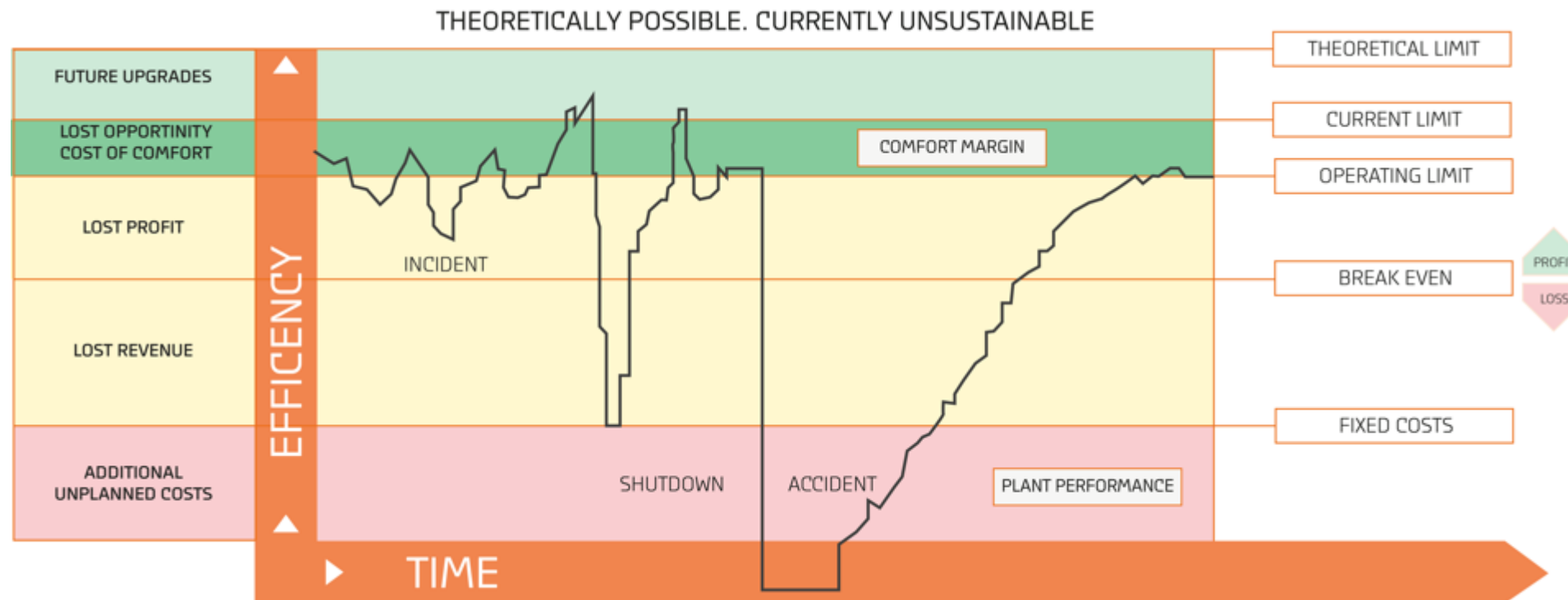
Alarm Viewer

Time	Level	Source	Channel	User	Def	Value	Unit	Priority	Channel	Message	Response/Status
2009-06-02 09:23:02	Limit	SULPHURIC	Channel_0	User	Def	0.009421019	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	TEST	Channel_0	User	Def	0.009421019	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	TEST	Channel_0	User	Def	48.0	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	MIXTURE	Channel_0	User	Def	20.004639	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	SULPHURIC	Channel_0	User	Def	0.44344157	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	TEST	Channel_0	User	Def	45.0	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	TEST	Channel_0	User	Def	0.009421019	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	SULPHURIC	Channel_0	User	Def	0.6635348	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	TEST	Channel_0	User	Def	41.0	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	MIXTURE	Channel_0	User	Def	0.2709394	Low	192	John message sul	Required	
2009-06-02 09:23:02	Limit	SULPHURIC	Channel_0	User	Def	0.02965525	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	TEST	Channel_0	User	Def	39.0	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	MIXTURE	Channel_0	User	Def	0.21913764	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	SULPHURIC	Channel_0	User	Def	0.21913764	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	TEST	Channel_0	User	Def	38.0	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	TEST	Channel_0	User	Def	0.009421019	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	MIXTURE	Channel_0	User	Def	29.449152	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	SULPHURIC	Channel_0	User	Def	0.6635348	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	TEST	Channel_0	User	Def	32.0	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	MIXTURE	Channel_0	User	Def	0.772794	Medium	192	John message sul	Required	
2009-06-02 09:23:02	Limit	SULPHURIC	Channel_0	User	Def	0.16136519	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	TEST	Channel_0	User	Def	30.0	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	TEST	Channel_0	User	Def	0.009421019	Critical	192	John message sul	Required	
2009-06-02 09:23:02	Limit	MIXTURE	Channel_0	User	Def	0.33276188	Low	192	John message sul	Required	



# Challenge - Losses

Industrial plants loose 3-8 % production due to unplanned upsets



Source: Abnormal Situation Management Consortium with members from e.g. BP, Total, ConocoPhillips, ExxonMobil, Shell, Sasol and Honeywell



# Our approach

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## 3 Counteraction

Fastest and safest return to normal situation

## 2 Consequence

Future propagation of the abnormal situation

## 1 Cause

Immediate detection of the root cause behind the abnormal situation





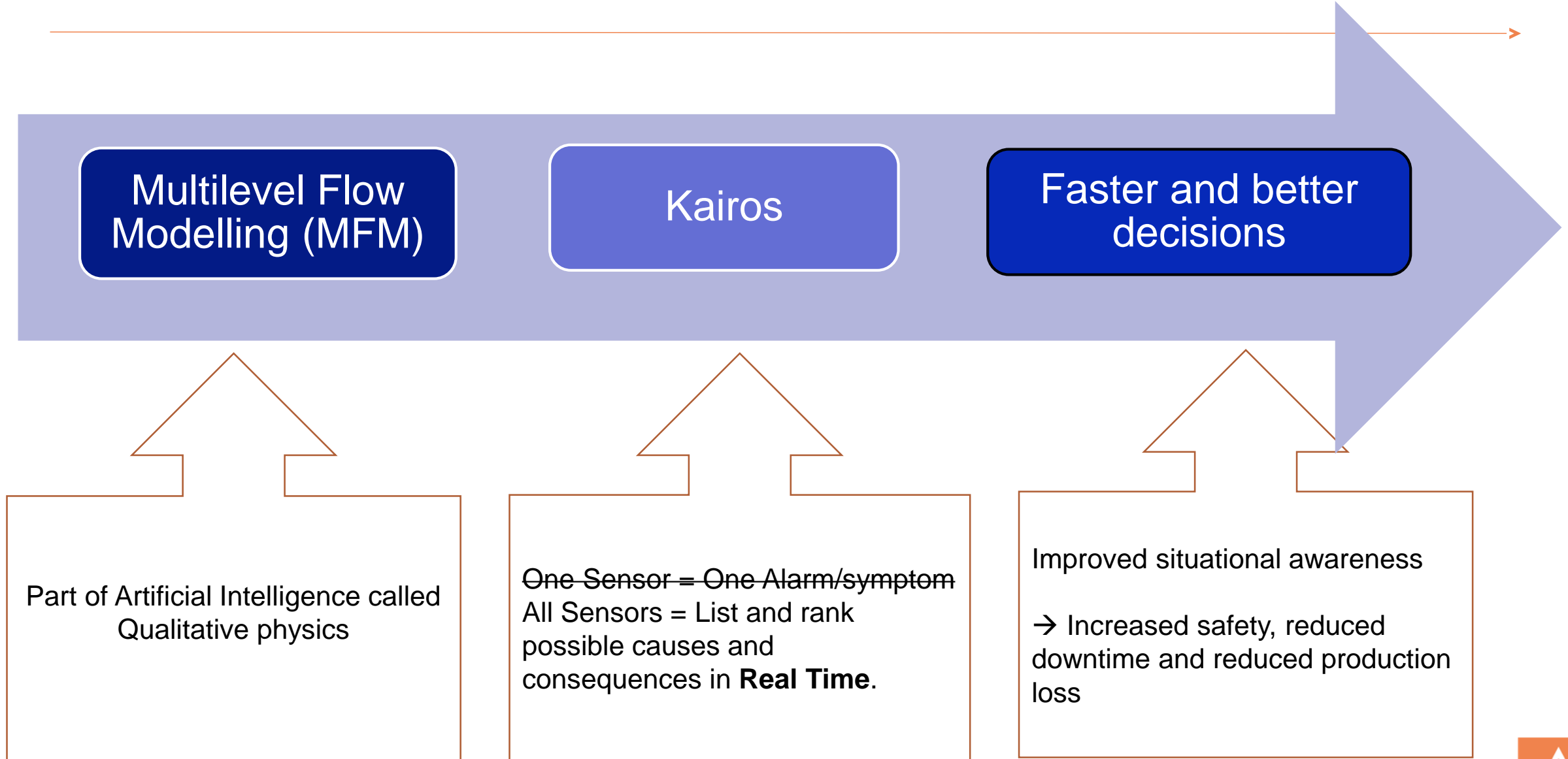
Our vision

Assist operators  
to perfection

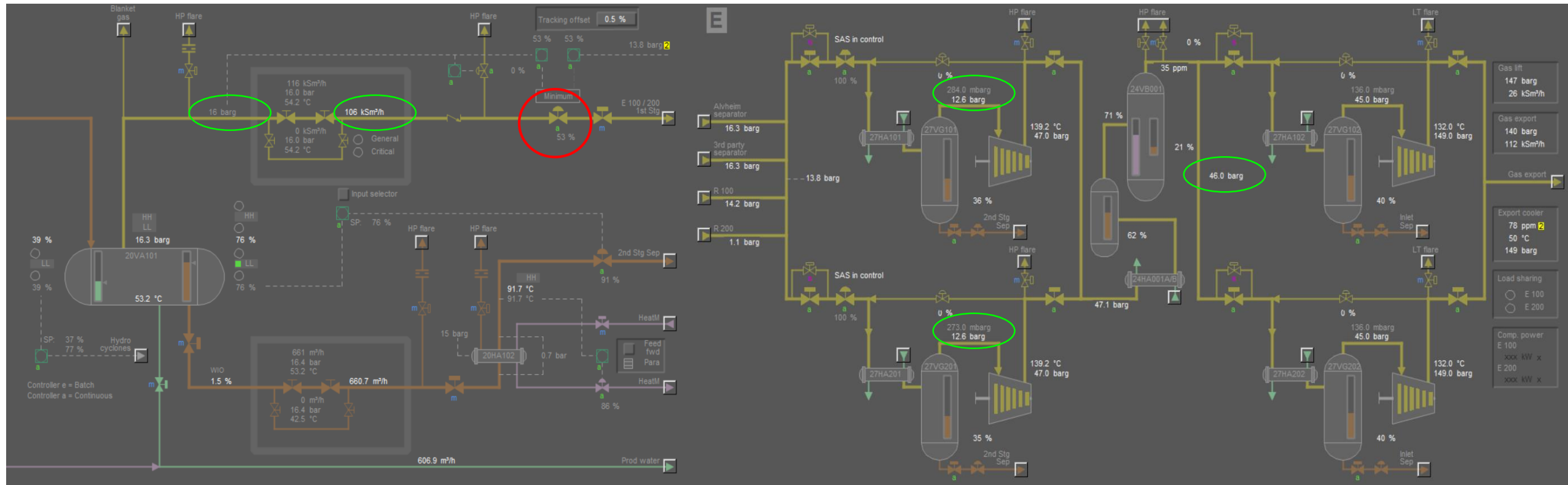


KAİROS®

# The technology powering our control room assistant



# Scenario: Failure of gas outlet valve on separator



# Control Room Assistant user interface



## OBSERVATIONS

☐ Hide stale

09:35

09:40

09:45

09:50

09:55

09:59





TOP 10 CAUSES

- HIGH** 27PV0525 Malfunction  
Export Gas Line. Failure of controller or valve. 2
- LOW** Gas to E-compressor train  
Gas from recomp train. 2
- HIGH** 24VB001/VG001Gas Leak  
From glycol contactor 24PV0167&PSV 2
- HIGH** E 100/200Gas Pass to Fl.  
BDV/PSV Leak to HP Flare. Export Compressor ... 2
- LOW** 20PV0213A Malfunction  
3rd Party Sep Pressure. Failure of controller or v... 2
- LOW** 20PV0113A Malfunction 2
- HIGH** 20VA201 Gas Pass to Fl.  
PV/BDV/PSV Leak to HP Flare. 3rd Party Separa... 2
- HIGH** 20PV0213B Malfunction  
3rd Party Separator 2
- HIGH** 20VA101 Gas Pass to Fl.  
PV/BDV/PSV Leak to HP Flare. Alvhheim Separator 2

Make a selection to explore relations

2 CONSEQUENCES

0 EQUIPMENT STATUS

- 2 **LOW** 27KA201 Disch Press  
27PT5650BX Discharge 1st Stg Exp Comp 200
  - 1 **LOW** 27KA101 Disch Pressure  
27PT5150BX Discharge 1st Stg Exp Comp 100
- Show more + Reset list ↺

1<sup>st</sup> two sensors

OBSERVATIONS ☐ Hide stale

2 ONGOING	27KA101 Suction Press 27PT5150AX Suction 1st Stg Exp Comp 100	<div><div></div></div>	<div><div>LOW</div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div>LOW</div></div>	now
	27KA201 Suction Press 27PT5650AX Suction 1st Stg Exp Comp 200	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div>LOW</div></div>	<div><div>LOW</div></div>	now
4 RECENT	24VB001 Press 24PT0167 Glycol contactor	<div><div></div></div>	<div><div></div></div>	<div><div>LOW</div></div>	<div><div>LOW</div></div>	<div><div>LOW</div></div>		6 min ago
	Press. in Alvhheim Sep 20PT0113	15:25	15:30		15:35	15:40	15:45	15:48 6 min ago



## TOP 10 CAUSES

## TOP 10 CONSEQUENCES

## 0 EQUIPMENT STATUS

## 2 SELECTED OBSERVATIONS

## Three more Sensors improved ranking

## OBSERVATIONS

☐ Hide stale

**5 ONGOING**

Press. in Alvheim Sep

20PT0113

### Gas from Alvheim Sep

20FYI0127X

## 24VB001 Press

24PT0167 Glycol contactor

## 27KA101 Suction Press

27PT5150AX Suction 1st Stg Exp Comp 100

15:25

LOW

15:30

15:35

15:40

15:45

15 515 5.0W

2 min ago



# Highlights

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- Reduce impact of upsets
- Share knowledge between operators
- Use learnings from incidents and investigations in real time
- Make the HAZOP available real time
- Combine explicit (from design) and implicit (from experience) knowledge.





# Thank you!

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