

#becomeoneteam



DROPS

DROPPED OBJECTS
PREVENTION SCHEME

AI-Powered Red Zone Monitoring: Discover how KCA Deutag and Shell Oman leveraging artificial intelligence to monitor video feeds to prevent unauthorized access to restricted zones.

KCA Deutag is a leading international drilling, engineering and technology company working onshore and offshore with a focus on safety, quality and operational performance.



شل عُمان
Shell Oman

#enhancethebrand

www.kcadeutag.com

KCA DEUTAG

Introduction / Table of Content

FX-Control RZS – Red Zone Supervision

- FX-Control
- Camera Technology

- Red Zone Boundaries
- Object Detection

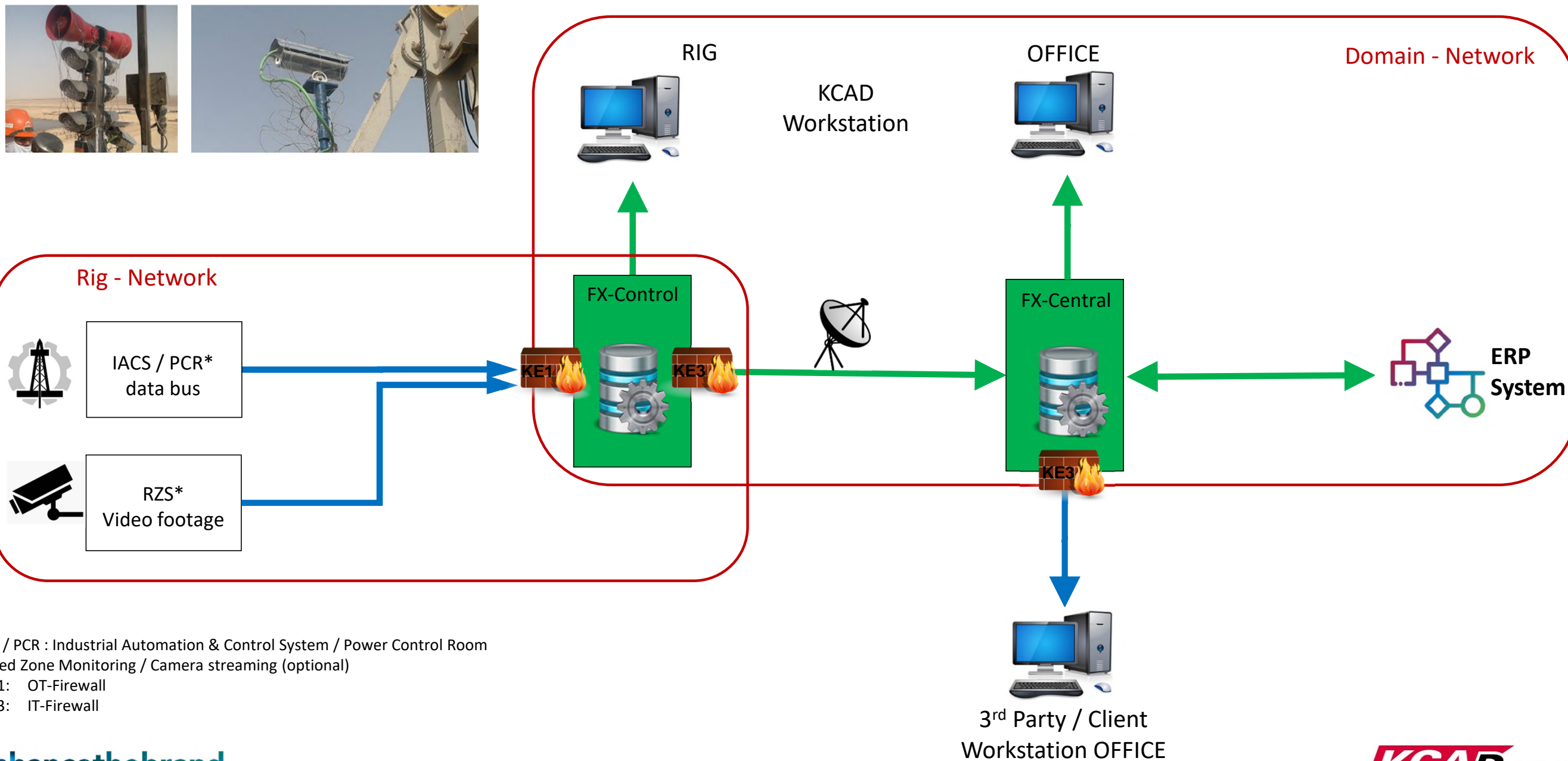
- User Interface

- Sample video capture 1
- Sample video capture 2

- Data Analytics
 - Statistics
 - Trends

- SUMMARY

FX-RZS functional data flow

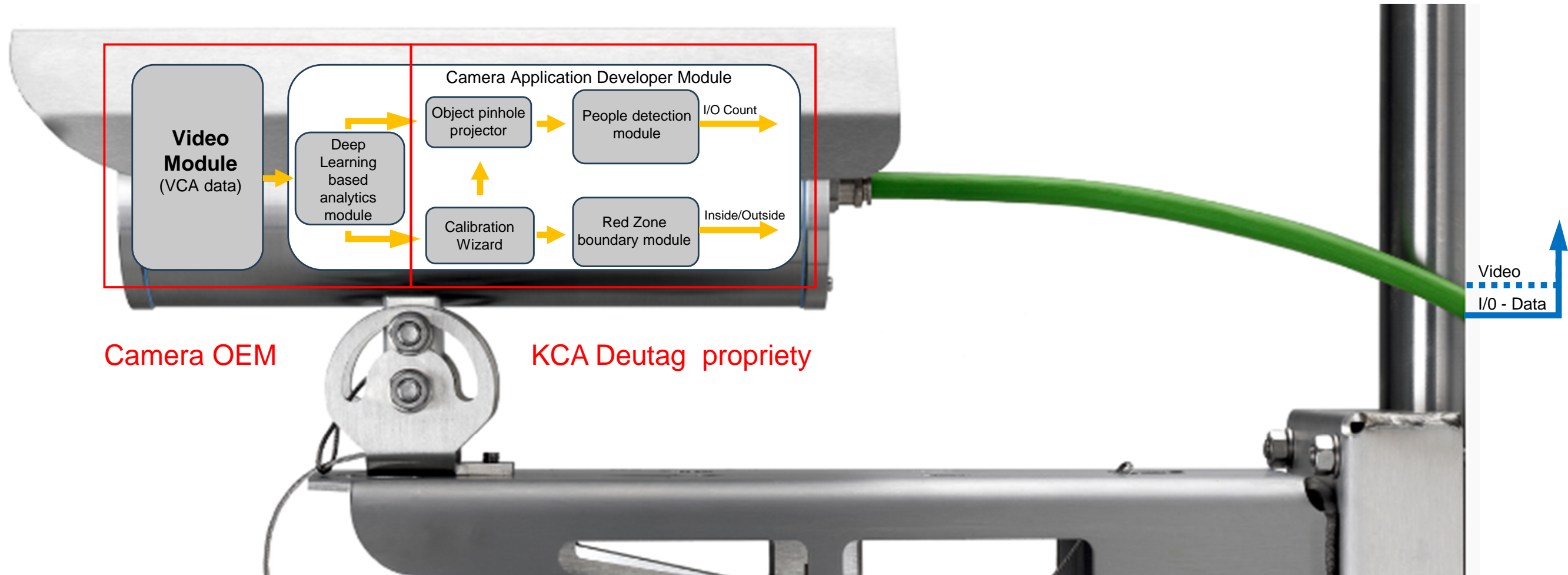


* IACS / PCR : Industrial Automation & Control System / Power Control Room

* FX-Red Zone Monitoring / Camera streaming (optional)

- KE1: OT-Firewall
- KE3: IT-Firewall

The "AI" in Red Zone Monitoring



Camera OEM

KCA Deutag propriety

FX-RZS object detection (on the edge)

- **Red Zone Boundaries**

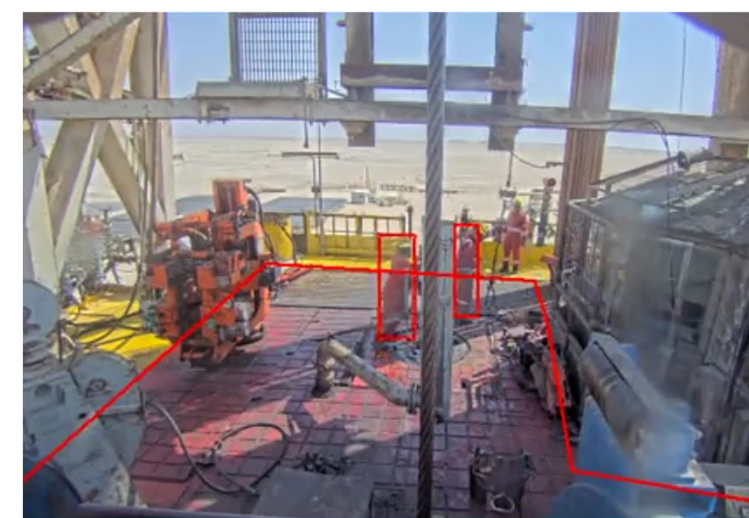
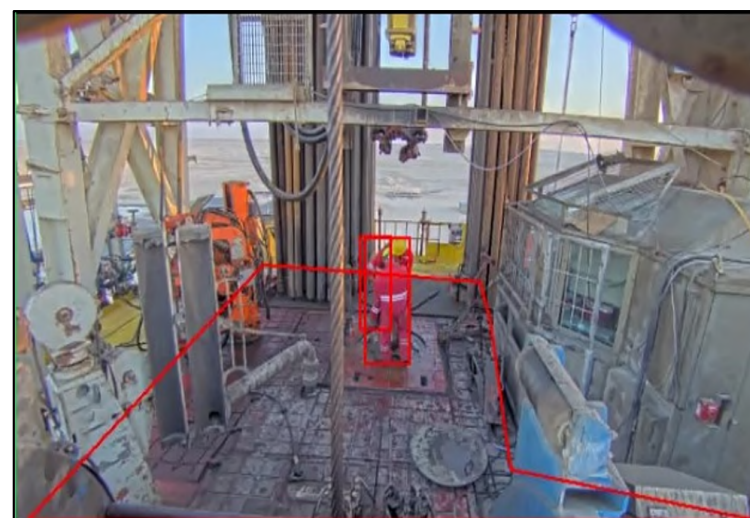
Red Zones are defined based on number of cameras, view angle and the area that supposed to be supervised.

Red Zones can be revised or amended through a user interface / setup wizard if needed.



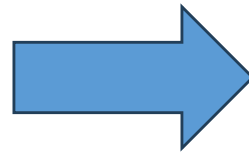
- **Object detection**

The FX-RZS is trained on person detection. Detection meta data of the camera(s) is analysed and turned into person detected within the red zone boundaries.

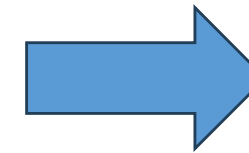
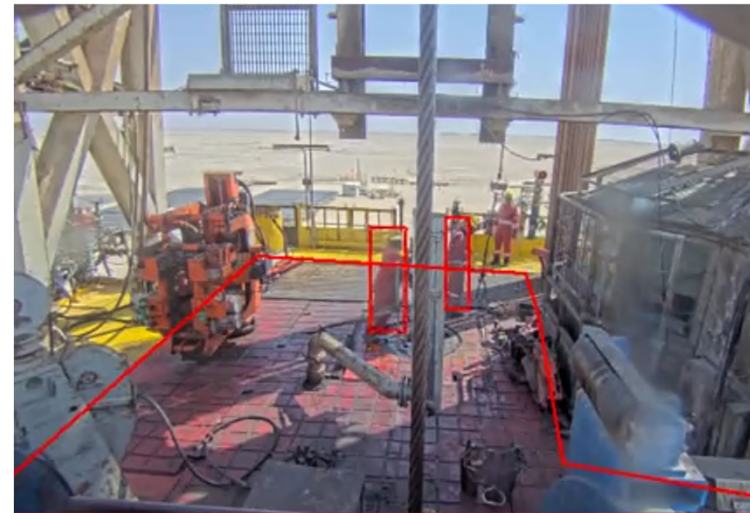


FX-RZS

1



2



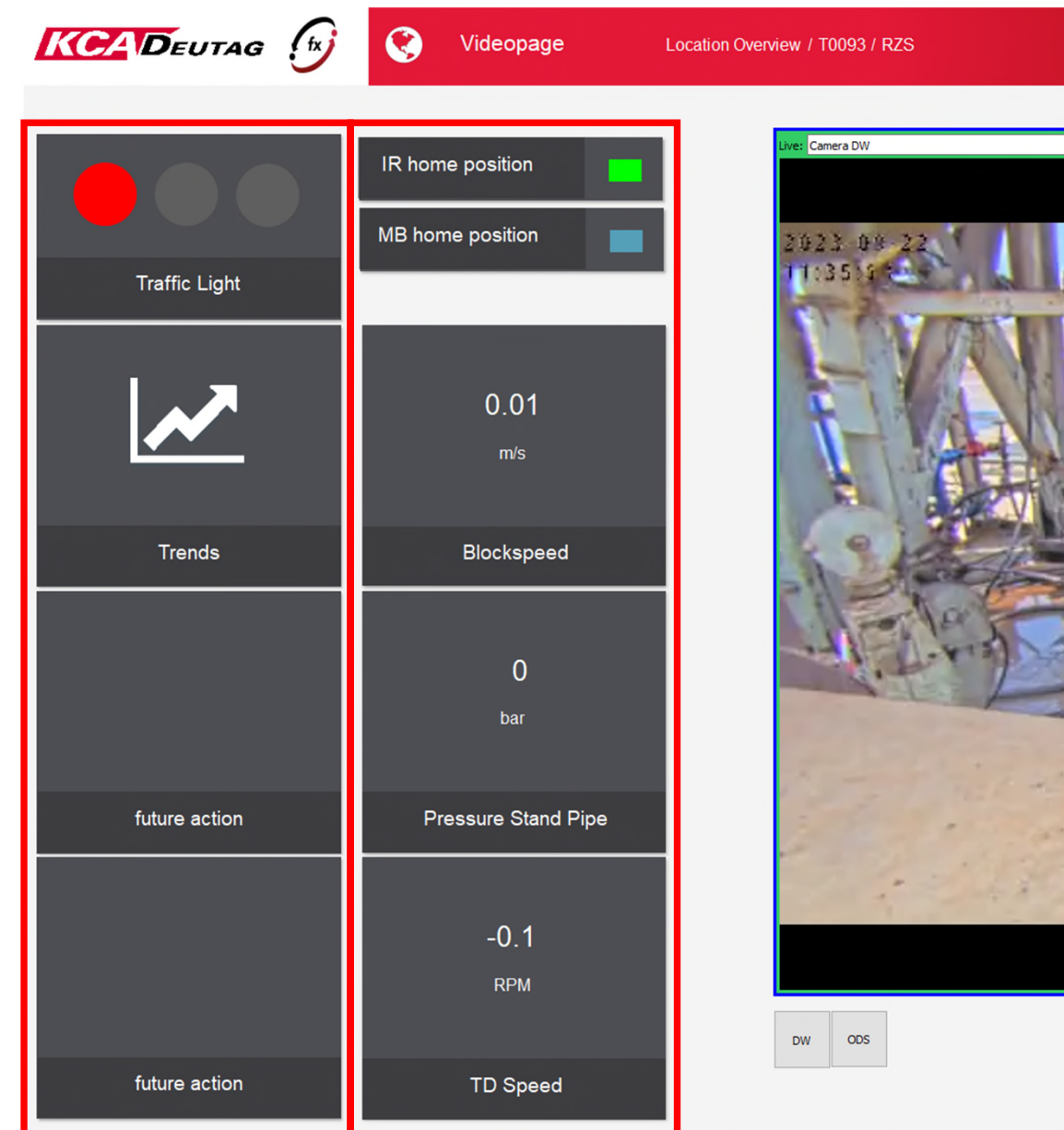
3



AI-Powered Red Zone Monitoring: leveraging artificial intelligence to monitor video feeds to prevent unauthorized access to restricted zones.

FX-RZS user interface

- **Traffic Light**
 - RED: machine activity
 - RED flashing: person detected inside red zone
 - GREEN: all machine on standby
 - GREEN flashing: person detected in red zone
- **Trends / future action**
 - Trends & Statistics
 - Placeholder for KPIs
 - Placeholder for others
- **Iron Roughneck home position**
 - BLUE: machine activity
 - GREEN: in park / home position
- **Mud Bucket home position**
 - BLUE: machine activity
 - GREEN: in park / home position
- **Block Speed**
 - > 0.1 m/sec >20ft/min
 - (and DW brake open)
- **Pressure Standpipe**
 - >20bar >290psi
 - (>145bar) (>2100psi)
- **Top Drive Speed**
 - > 0,5rpm



FX-RZS people behaviour

- Time: 00:00
Standpipe pressure: SPP >145bar
Top Drive revolution: > 0,1rpm
Block speed: 0.00 m/sec
Mud bucket: home position
Iron roughneck: home position

= conditional red zone: **RED**
- Time: 00:05
Person walks into red zone to clean drillers cabin windows – **RED flashing**
- Time: 00:26
Person walks out the red zone – **steady RED**
- Note:
Precision of red zone border detection.

KCA DEUTAG fx Videopage Location Overview / T0093 / RZS holger.egbers

Traffic Light

IR home position MB home position

Trends

0.00 m/s

Blockspeed

185 bar

Pressure Stand Pipe

63.5 RPM

TD Speed

Live: Camera DW

Operation: ROTDR
Total Depth: 2527.44 m

DW ODS

FX-RZS people behaviour

- Time: 00:00
No activity: DW brake closed, no SPP

= conditional red zone: **GREEN**
- Time: 00:02
Driller opens DW brake

= conditional red zone: **RED**
- Time: 00:10
Persons walking into red zone to pull slips
RED flashing
- Time: 00:28
String is lifted: **RED**, DW brake closes, zone turns **GREEN**. Brake opens again, zone: **RED**
- Time: 00:36
DW brake closes- zone turns **GREEN flashing**
- Time: 00:40
People leaving the rig floor, zone turns **steady GREEN**.
- Time: 01:08
Pump start up, pressure rising. At 145 bar zone **turn RED, TDS start-up**

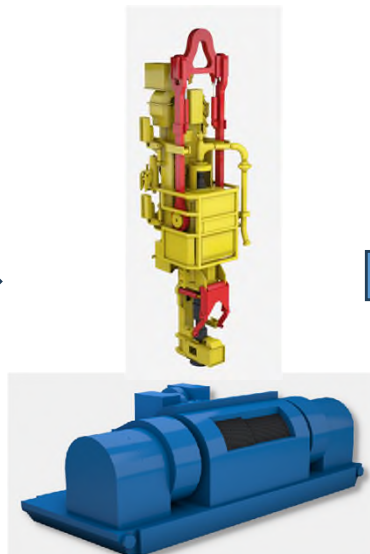
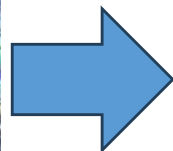
The screenshot displays the KCA DEUTAG Videopage interface. At the top, the header includes the KCA DEUTAG logo, a globe icon, the text 'Videopage', the location 'Location Overview / T0093 / RZS', and a user profile for 'Tobias.Traband'. The main content area is divided into several panels:

- Traffic Light:** Shows three circles, with the rightmost one illuminated in green.
- Trends:** Displays a line graph with an upward-pointing arrow.
- IR home position:** Indicated by a green square.
- MB home position:** Indicated by a green square.
- Blockspeed:** Shows a value of 0.00 m/s.
- Pressure Stand Pipe:** Shows a value of 3 bar.
- TD Speed:** Shows a value of -0.1 RPM.

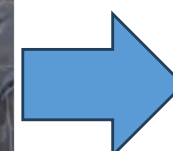
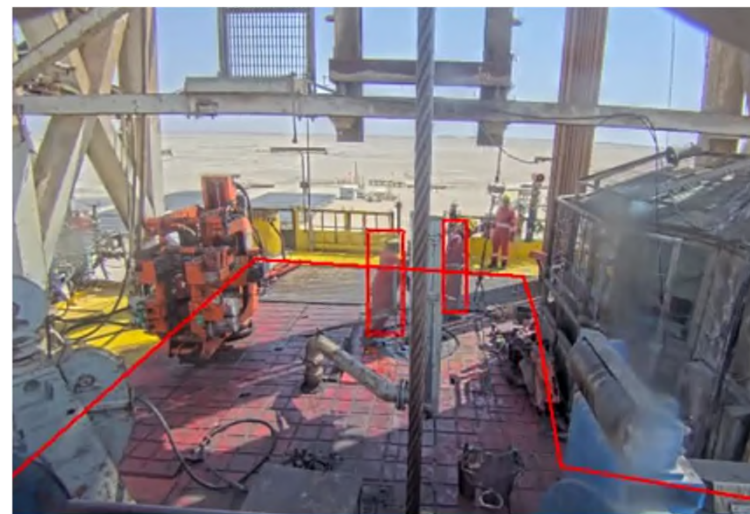
A large live camera feed on the right shows an industrial rig floor with yellow safety railings and various equipment. The camera feed includes a timestamp '2023-09-13 13:22:09' and a status bar at the bottom indicating 'Operation: RIH' and 'Total Depth: 3044.92 m'. Below the camera feed are two small buttons labeled 'DW' and 'ODS'.

FX-RZS

1



2



3



AI-Powered Red Zone Monitoring: leveraging artificial intelligence to monitor video feeds to prevent unauthorized access to **conditionally** restricted zones.

FX-RZS Trends & Statistics

Breach Time - by Well

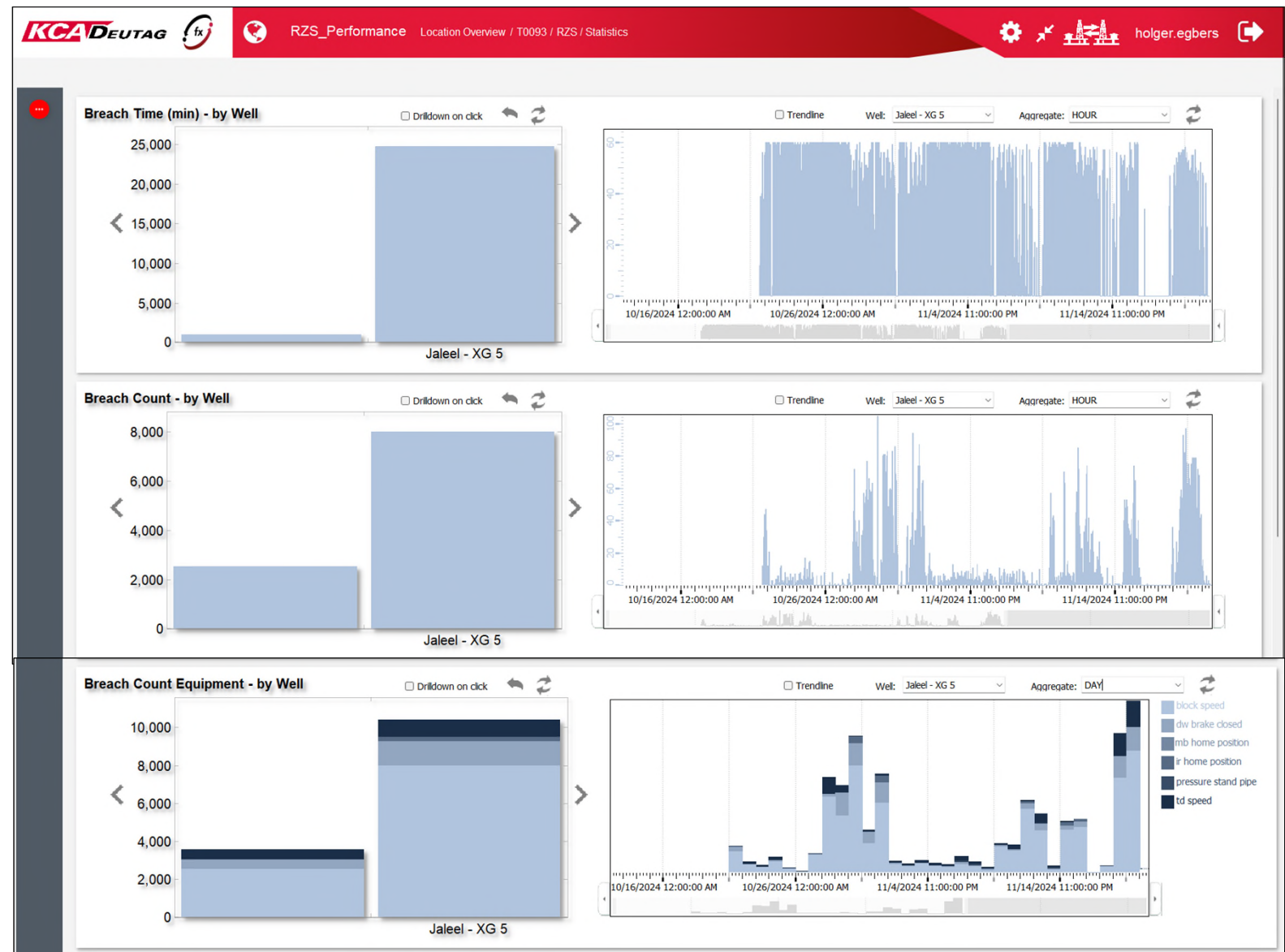
Accumulated time, in Minutes a breach has been detected (The time from entering / breaching the zone until leaving / clearing the zone.)

Breach Count - by Well

The quantity of breaches accumulated on an hour basis (One person enters the red-zone is counted as one breach)

Breach Count Equipment

Total number of breaches caused by equipment (A person enters the red-zone and causing a breach, because an equipment is active).

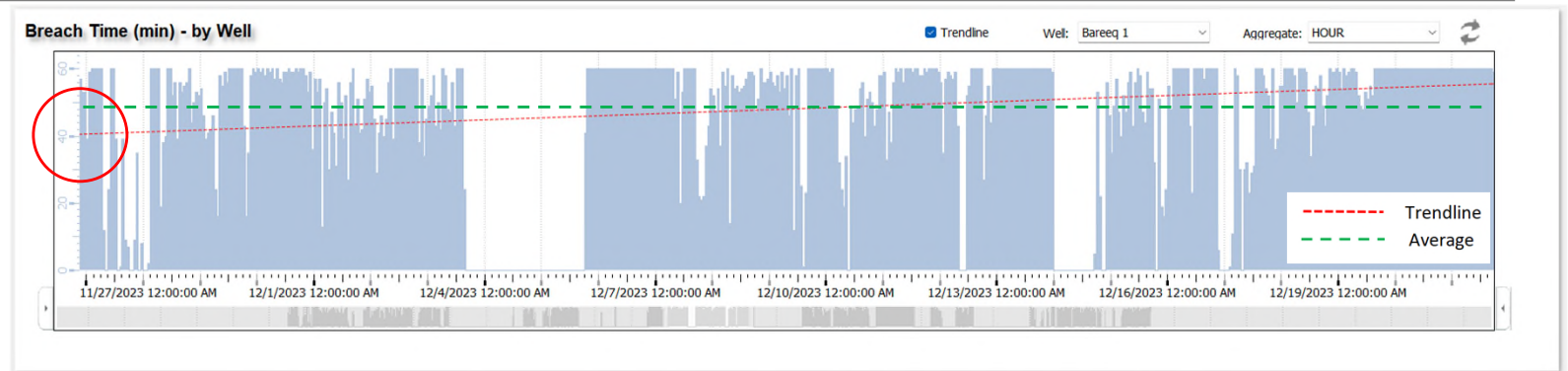


FX-RZS operation activity

FX-RZS functional, traffic light OFF

Breach time average: 48min / hour.

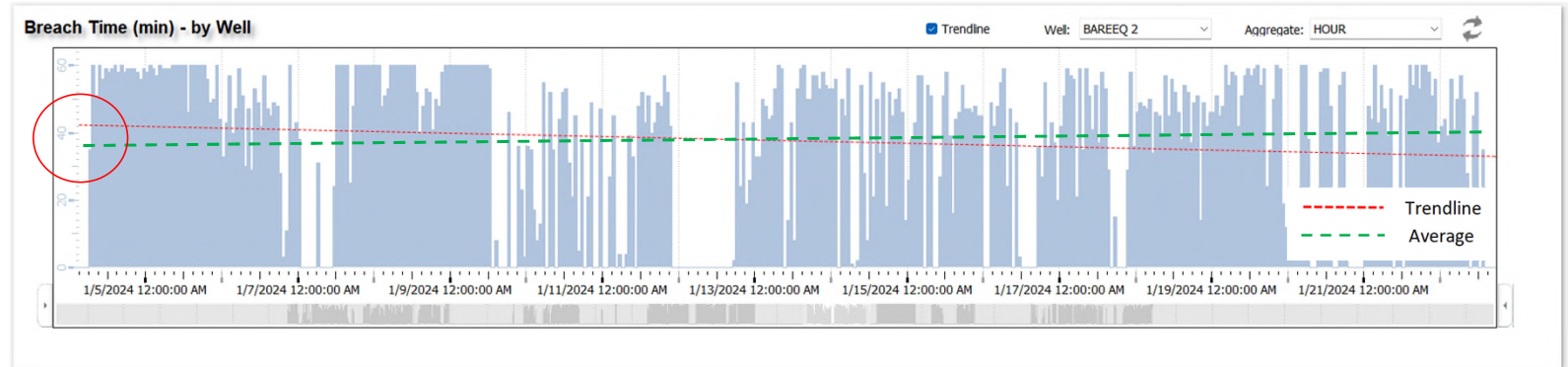
27/11 – 21/12/2023 = 26 Days
 Drilling & tripping > 728m – 1.421m TD
 X axis: date, hour based
 Y axis: time, minutes based



FX-RZS functional, traffic light OFF – Crews aware of FX-RZS is recording breaches

Breach time average: 36min / hour.

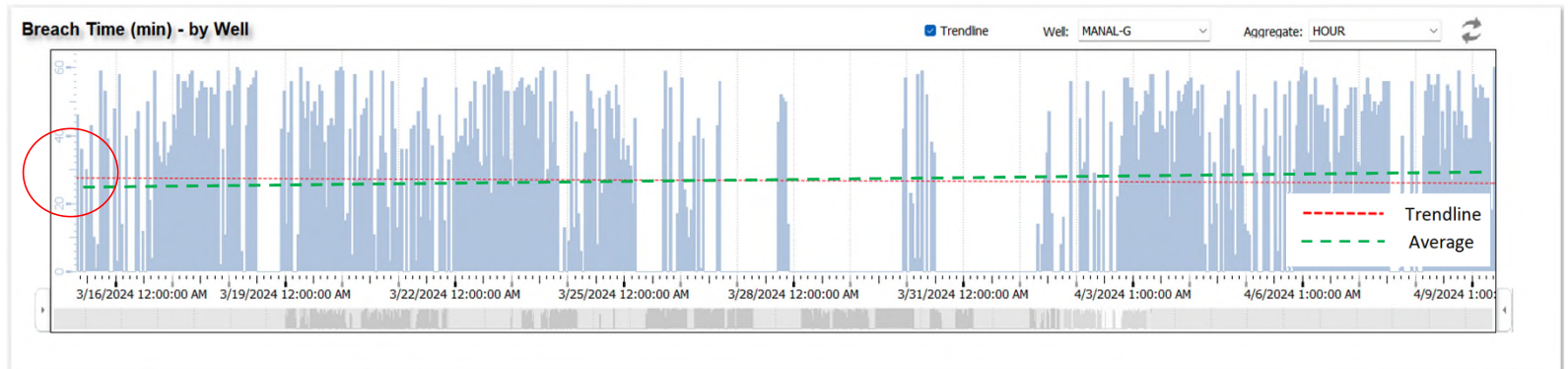
05/01 – 23/01/2024 = 18 Days
 Drilling & tripping > 683m – 1.178m TD
 X axis: date, hour based
 Y axis: time, minutes based



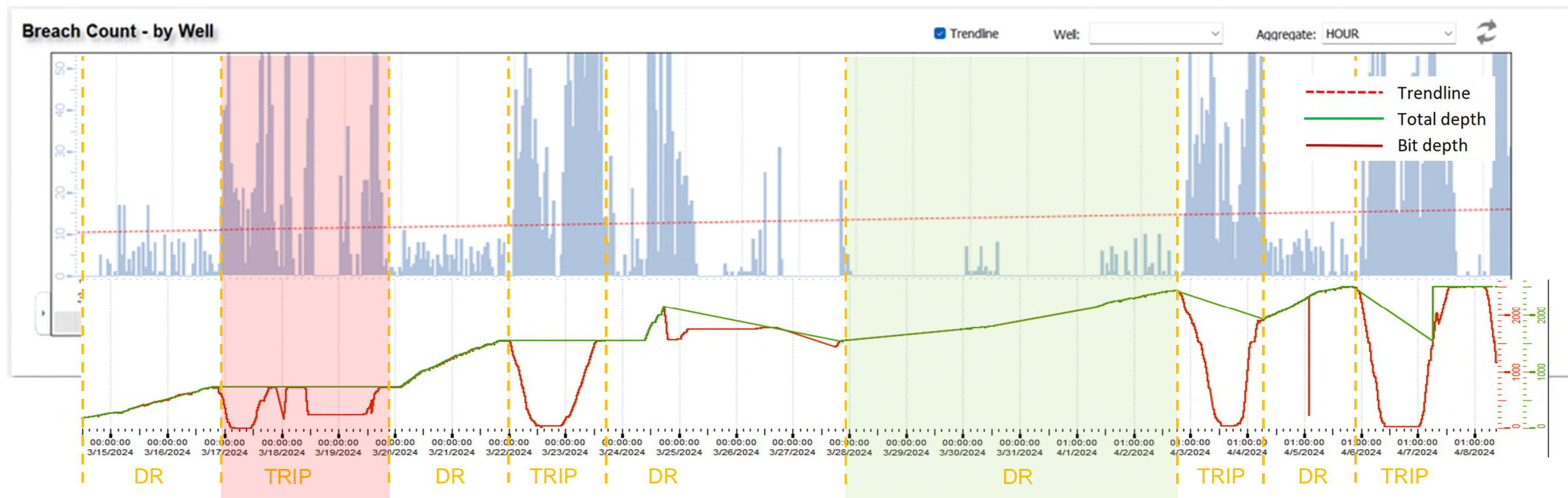
FX-RZS functional, traffic light switched ON

Breach time average: 26min / hour.

16/03 – 09/04/2024 = 25 Days
 Drilling & tripping 731m – 2.500m TD
 X axis: date, hour based
 Y axis: time, minutes based



FX-RZS operation activity



Breach count (quantity of entries) overlay with operations (drilling / tripping / other activities)

Breach count: 5 breaches vs. >21 breaches (avg.)

16/03 – 09/04/2024 = 25 Days
Drilling & tripping 731m – 2.500m TD
X axis: date, hour based
Y axis: count, total counts

FX-RZS Summary

1. **AI driven object detection enables Red Zone Monitoring technology that helps to detect unauthorized access to hazardous areas or it identifies ineffective barriers.**
2. **Machine and operational data enables the definition of a conditional red zone, in real-time. Combined with object detection data personnel are warned / notified if the hazard is invisible (high pressure, open brake) or when the zone turns from a safe to a hazardous zone (start-up of machines / increase in pressure). It increases the effectiveness of barriers.**
3. **Through statistics and real-time data analytics; activities, processes and as well machinery can be improved. Specific risks can be designed out.**
4. **The technology doesn't prevent objects from falling, but it reduces the time/number of people being in the line of fire when it happens. It adds another layer of control and complements the Shell Dropped Object Prevention Guide
FX-RZS provides useful insight when creating JBDs**

Work in progress: manual override

Override "Off" for specific operations requiring people in the red zone, which is then covered by PTW

Override "On" for working at height, or specific operations not changing the conditional red zone

Future steps:

Enhance the data analytics in real-time to generate KPIs and warnings if abnormal number of breaches are detected.

Integrate more activities / operations (casing running / catwalk area)

Digital human factors Data analysis



A **kenera** innovation

-
- + Turns data into value
 - + Reduces invisible lost time
 - + Evaluates performance trends
 - + Promotes continuous improvement