Total Safety & Z-Safety Systems
Global Partnership

134 Facilities in 18 Countries; Presence in Another 14

West-European References
Z-Safety Services | Z-Safety Systems
Safety supervision in confined spaces: 
...a challenge?

- TA & project trends in Europe
- Solutions in technology
- Added value in safety output & cost effectiveness

Specialized Safety Personal (SSP)
Period 2008 - 2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Total</th>
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<tr>
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<td>1106559</td>
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</table>
Trends in safety supervision
Daily maintenance, TARs & projects

• ↑ workload & ↓ working time
• ↑ job requirements concerning safety
• ↓ job appreciation & valuation
• Experience (13 years) & lessons learned

...TECHNOLOGY as support

Z-Monitoring
Technology as support

SAFETY GUARDS
MONITORING SUPPORT

OLD SITUATION
NEW SITUATION

RIGHT “BALANCE” BETWEEN MAN & TECHNOLOGY
HIGHER SAFETY LEVEL - MORE CONTROL

Improved safety supervision through technology
Actual situation
Safety guards

1. PERMIT CHECK
6. ALARMING
2. ACCESS REGISTRATION
5. COMMUNICATION WITH ENTRANTS
3. LOCAL GAS DETECTION
4. SAFETY OBSERVATION

Z-Monitoring
Man versus technology

Automatic access control
Continuous gas detection
Camera surveillance
Communication
Alarming
Wireless data transfer

Central Control Unit
Standard configuration

Safety equipment

<table>
<thead>
<tr>
<th>PER WORK SPOT</th>
<th>Standard</th>
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</thead>
<tbody>
<tr>
<td>2x access control</td>
<td>1x outside manhole</td>
</tr>
<tr>
<td></td>
<td>1x inside manhole</td>
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<tr>
<td>4 + 1 gas detection</td>
<td>O₂, LEL, H₂S, CO</td>
</tr>
<tr>
<td></td>
<td>+ 1 optional (PID, …)</td>
</tr>
<tr>
<td>2x camera monitoring</td>
<td>1x outside manhole</td>
</tr>
<tr>
<td></td>
<td>1x on the work spot</td>
</tr>
<tr>
<td>2x antennas</td>
<td>Dependent on the location/plant</td>
</tr>
<tr>
<td>2x communication &amp; alarming</td>
<td>2 intercom boxes</td>
</tr>
<tr>
<td></td>
<td>2 alarms + flashlights</td>
</tr>
<tr>
<td>1x Central Control Unit</td>
<td>Configuration &amp; setting per 12 work spots</td>
</tr>
</tbody>
</table>

BALANCE BETWEEN MAN & TECHNOLOGY

Technical features

Access control

- 1 badge reader INSIDE the manhole
- 1 badge reader OUTSIDE the manhole

- Personalized active RFID tokens
- Max reader/tag distance:
  - standard: 1m
  - long range: up to 5m (upon request)
- Data transmission between badge readers on different levels is ensured by RS485/ETH network
- Possibility to create different zones, access levels and user profiles up to 10,000 users
- Roll call and head count information within a mouse click in case of emergency
Automatic access control

Standard No Autorisation

No Autorisation

Access rights per reactor

Authorisation for Reactor 1205
**Automatic access control**

**Access rights per reactor**

Every IN event is visible to the Operator. **GREEN** = Authorised access. **RED** = Unauthorised access. Operator intervention required.

**RED** = Unauthorised access for R1204

**GREEN**: Access allowed for R1205

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**Automatic access control real time visualisation of number of people**

Reactor numbers

Number of people per reactor

Total number of people per area

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Coking – Safety & Reliability Seminar 2012 | Matty Zadnikar
Technical features
Gas detection

• **STANDARD** configuration: O₂ - LEL - H₂S – CO (up to 40 different gasses possible – upon request)
• **1 OPTIONAL** sensor possible: PID - dust - temperature - humidity
• Gas detection through a sampling system, minimizing the disturbance of sensors in the confined space

• Continuous flow control in the sampling system (2 l/min)
• Continuous monitoring of sensor condition through “heartbeat”
• Full event logging (calibration-bump test-gas out-breaks-temperature…)
• Sampled gas is conditioned and filtered (dust & watering filter)
• Stand-alone alarming (no operator action or communication with CCR needed to alarm)
• CE and UL approved (from 07/2012)

Permanent real time gas detection

Real time gas measurements
Permanent real time gas detection

Gas detection trend (measurement in reactor 1202 dd 3 januari 2012 om 07.55)

Technical features

Camera monitoring

- 1 camera INSIDE the manhole on the work spot
- 1 camera OUTSIDE the manhole to control the entrance and the environment of the access to the manhole

- Dual lens HiRes cameras (up to 3 MP)
- Day & night vision by IR blacklight
- Full event and data logging in camera
- PoE (Power over Ethernet) – no extra power cables needed
- Storage interval fully configurable to customer wish
Technical features CCTV

Registration when motion detected. Images can be reviewed.

The operator can take screenshots when dangerous situations occur.

Technical features

Antennas

- Wireless data transmission PTO (point-to-point) or PTMP (point-to-multi-point)
- Fully secured and 128 bit encrypted data transmission

- In accordance with RFI standards & therefore immune for in plant data/control system
- Uses 5.4 - 5.8 GHz band (16 channels)
- Max distance:
  - line of sight: up to 10 km
  - no line of sight: site visit /plan

Required to determine the number of APs (Access Points)
Technical features
Communication & alarming

- Communication system integrated in the cameras: activation by push-to-talk button
- 2 intercom boxes: 1 INSIDE / 1 OUTSIDE the manhole
- 2 alarms with flashlights (visual & acoustic): 1 INSIDE / 1 OUTSIDE the manhole

- Full duplex communication
- Activation locally & automatically by the gas detection system or remotely by the operator
- First alarm level = flash light
  Second alarm level = siren

Communication

The operator can communicate with the people in and around the confined space through the integrated intercom.
1. Manual activation of the alarms by operator in CCR

2. Automatic activation of the alarm by the gasdetection system

Technical features

Central Control Unit

- Visualization software platform to centralize, analyze and report all incoming data
- Continuous supervision of the work spots/confined spaces by trained professionals
- Tick boxes to check/indicate the work permits, required PPE and atmosphere
- Clear visualization of alarm conditions and status (green/orange/red + sound)
- Visual & acoustic pop-ups in case of incoming call
- Continuous check of network condition and status
- Logging of operator by check-in each change (alternately active in control room and in the field – rotation every 2 hours)
Technical features
Central Control Room (CCR)

Camera images reactors R1101 – R1105
Gas measurements in reactors 1101 - 1105

Access control
Camera images reactors R1201 – R1205
Gas measurements in reactors 1201 - 1205

Standard configuration
Safety supervision

<table>
<thead>
<tr>
<th>Number of work spots</th>
<th>INSIDE in the CCU</th>
<th>OUTSIDE in the field</th>
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<tbody>
<tr>
<td>1 – 12</td>
<td>1</td>
<td>1</td>
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<tr>
<td>12-24</td>
<td>2</td>
<td>2</td>
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<tr>
<td>24-36</td>
<td>3</td>
<td>3</td>
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<td>36-48</td>
<td>4</td>
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<tr>
<td>48-60</td>
<td>5</td>
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</table>

“RIGHT” BALANCE BETWEEN MAN & TECHNOLOGY
Z-Monitoring
Added value

↑ SAFETY ↑ EFFICIENCY

Continuous gas detection
- Measurement directly on the work spot/in the confined space
- Reliable reporting & trending of all gas measurements

Automatic access control
- Complete & detailed data of all entrances of the confined spaces
- Support towards on-site rescue team
- Reliable registration of all entrances

Camera monitoring
- Faster response time
- Direct communication in case of emergency
- Support of the on-site rescue team with direct images from the confined spaces
- Reliable live-stream reporting

Communication & alarming
- Intercom, visual & acoustic alarm on the work spot

Central Control Unit (CCR)
- Central follow-up & control room