

MSS[®] PERMANENT MONITORING SYSTEM

NEW TECHNOLOGY FOR LINER INTEGRITY CONTROL



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Texplor Group Locations:

- **TEXPLOR GROUP b.v. , Breda, Netherlands**
- Texplor Austria GmbH, Vienna, Austria (1993)
- Texplor GmbH, Potsdam, Germany (1994)
- Texplor Benelux b.v., Breda, Netherlands (2005)



Business activities:

- Specialization on **mobile & permanent** leakage detection – 25 years experience in all types of sealing constructions above + below water in civil & structural engineering (metro, tunnels, buildings)
- Geophysical surveys – dam investigations – stability (ERT Geoelectrics, Radar, Microgravity, Magnetics, etc.)
- approx. 300 - 350 service projects/year worldwide
- Reference projects in Netherlands, Germany, Austria, France, Italy, Denmark, Poland, Norway, Finland, Switzerland, China, Thailand, Russia, Abu Dhabi, Iraq, Saudi Arabia, Qatar, USA, Chile, ...
- DIN EN ISO 9001:2015 TÜV Certification since 2005, SCC, VCA, OHSAS



MSS[®] - Permanent Monitoring System

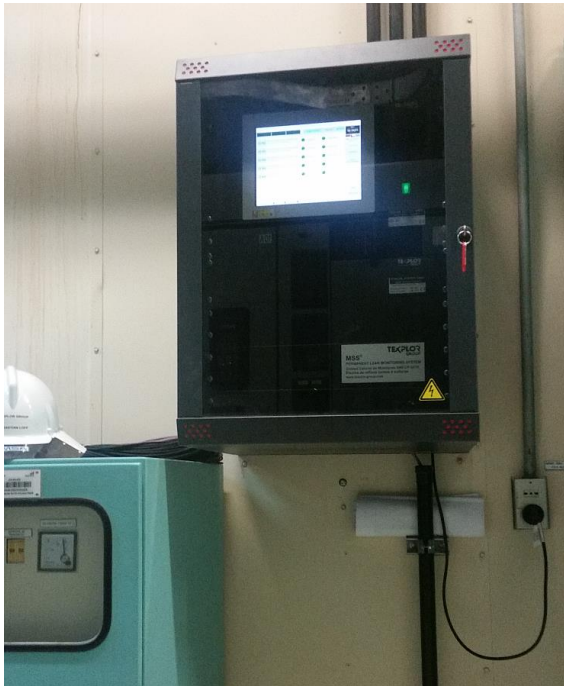
- Permanent Liner Integrity Monitoring
- Automated leak location
- all types of sealing systems – HDPE liners, mineral liners & combinations
- Operations: accord. DIN ISO 9001:2015, AS 6702, ASTM D 7909
- Patents: US, China, Europe

Milestones:

- Exceptional lifetime of MSS[®] CombiModule: +/- 100 years certified
- Resistant against liquids or material with pH values 1-14
- 1 CombiModule covers areas between 1.000 – 3.000 m² (Standard HDPE Liners – Conductive Liner)
- Highest resolution = Leak > 1 mm²
- Expandable system
- Postinstallation in already existing sites possible

MSS[®] Components:

Electronics:
Central Unit



Outdoor Cabinet



Sensors:
CombiModules

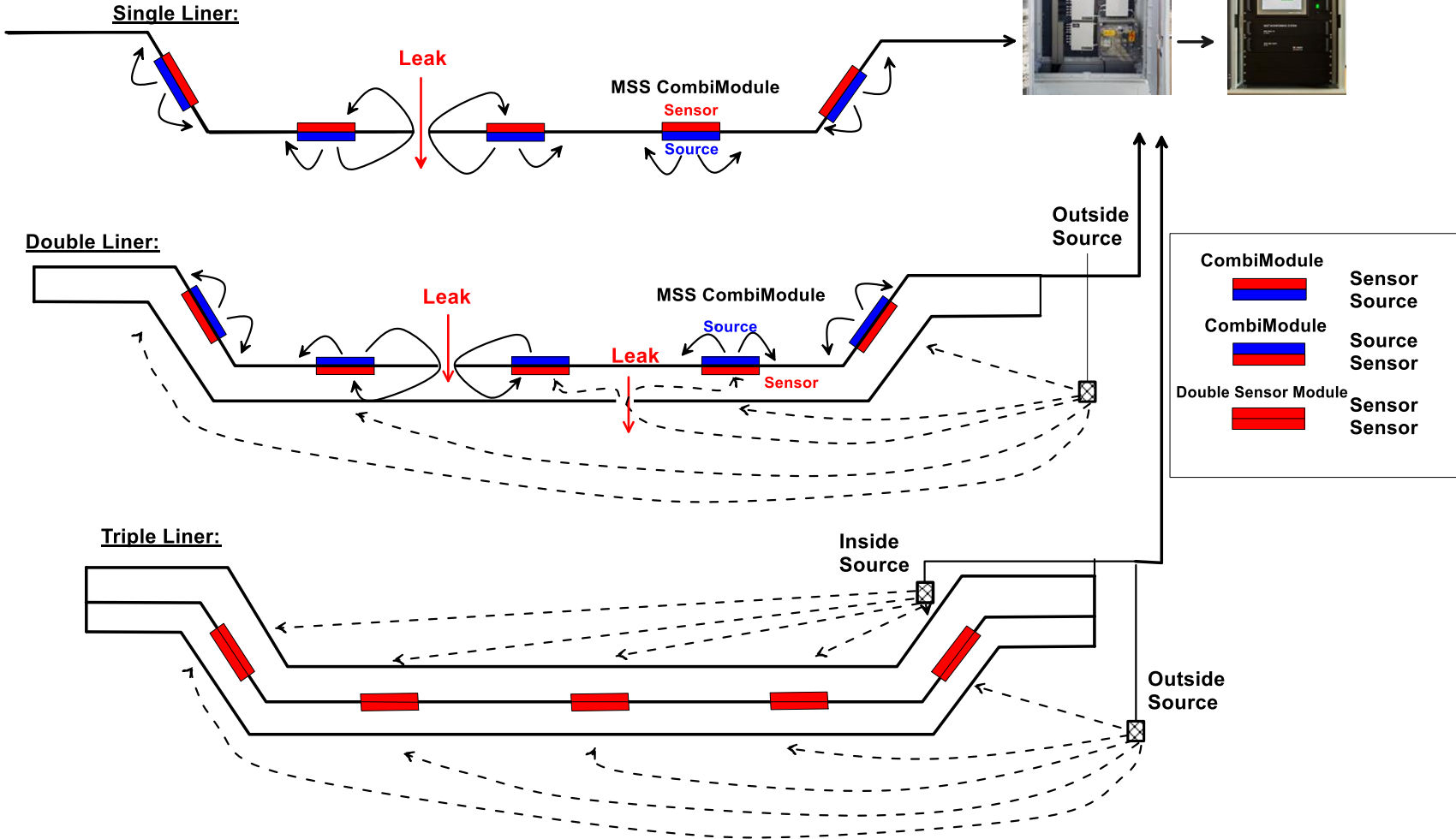
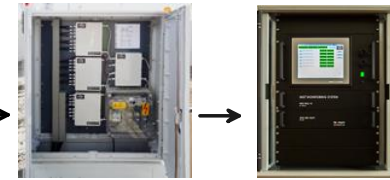


Outside sources



MSS[®] Schematic Layout:

Outdoor Cabinet Central Unit



MSS® Software: Display of Alarm

MSS® Result display:
Green = tight liner

Module ID	System Error	Leakage Alarm
CM 01	Green	Red
CM 02	Green	Green
CM 03	Green	Red
CM 04	Green	Green
CM 05	Green	Red
CM 06	Green	Green
CM 07	Green	Green
CM 08	Green	Green
CM 09	Green	Green
CM 10	Green	Green

Module ID	System Error	Leakage Alarm
CM 01	Green	Green
CM 02	Green	Green
CM 03	Green	Green
CM 04	Green	Green
CM 05	Green	Green
CM 06	Green	Green
CM 07	Green	Green
CM 08	Green	Green
CM 09	Green	Green
CM 10	Green	Green

MSS® Result display:
Red = untight liner at CM 01, CM 03 & CM 05 locations

Differences to other Systems:

- Exceptional durability of sensors (MSS[®] CombiModules):
Certified lifetime +/- 100 years
- CombiModule integration into Liner
- All installations from top (flexible distances, all cables above liner) – no basin size limit – system expandable any time
- Retro-fitting in older liner basins or existing landfill covers (post-installation into old liner or cover liner)
- 1 CombiModule covers 1.000 – 3.000 m² and more



Lifetime of Computer System + Electronics

Central Unit Hardware:

- Expected lifetime 5 – 6 years
- Warranty 12 months, expandable with Service Contract

MSS Operating Software Warranty 5 years

Electronic Installations (Outdoor Cabinets, outdoor cables):

- Expected lifetime 10 – 15 years
- Warranty 5 years

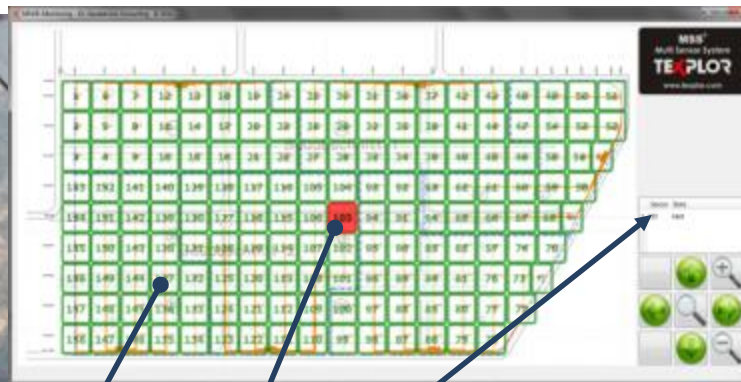
Developed & patented technologies by Texplor:

- **ECR[®]** Electrochemical Response System (1994, EP 94914506.4) - passive, mobile
- **EFT[®]** Electrical Tracer System (2003, EP 1387156A1) - active
- **FGM[®]** Flexible Groundwater Monitoring (2008, Germany 30778627) – passive + active, mobile
- **MSS[®] Permanent Monitoring of Sealing Constructions** (2005, EP 05020521.0)
Main Patent for MSS[®] Methodology (Software, hardware, layout)
- **MSS[®] Sensor/Source CombiModule** (Int. Pat. 2012, PCT/EP2012/069493 - 109 countries together with SCHUNK Group, Germany)

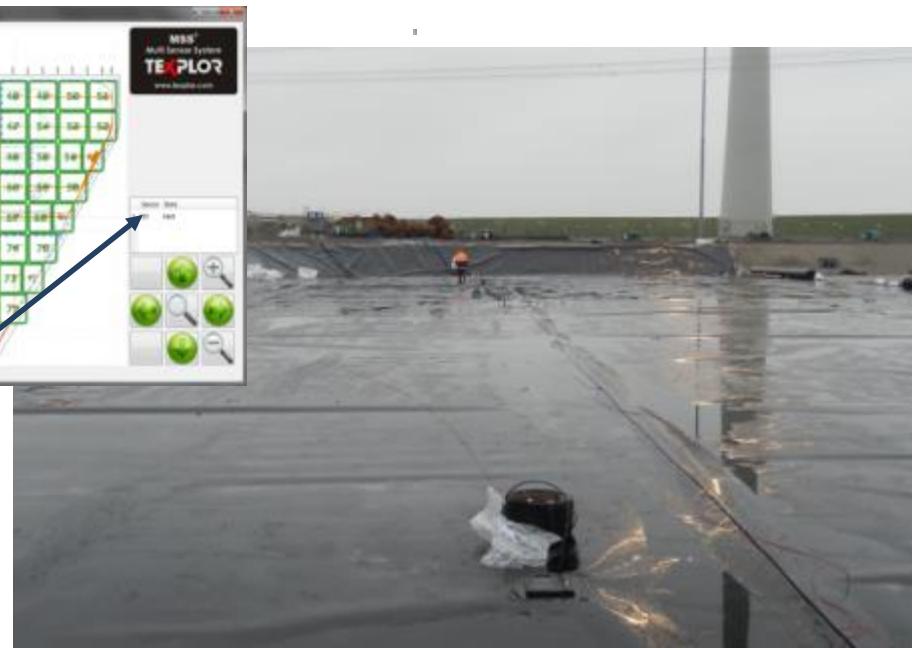


Example: Single Liner

- RWE - Energy Plant, Netherlands
- Basin for coal storage
- MSS® Monitoring of HDPE liner (173.000 m²)
- In operation since 2012
- 1 Central unit, 6 Outdoor cabinets
- 158 CombiModules (1 CM covers 1.000 m² liner)

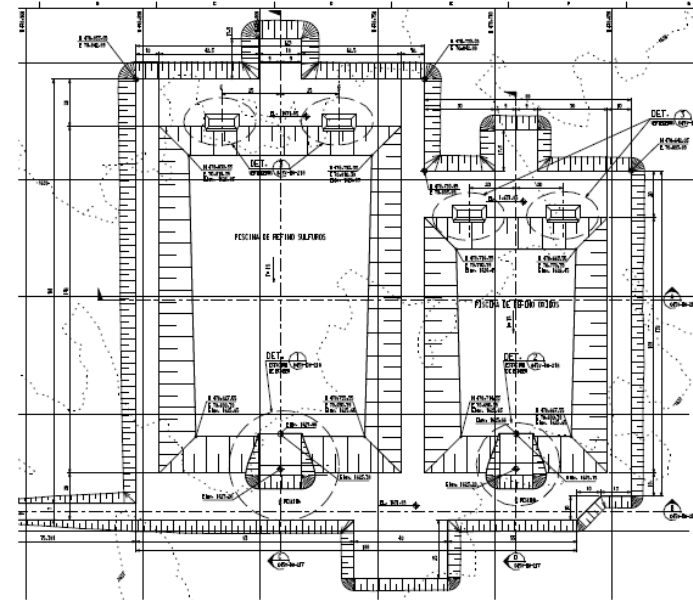


- Sensor field without alarm
- Sensor field with leak alarm
- List of all alarms



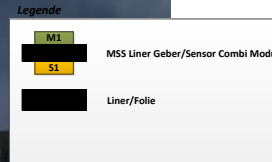
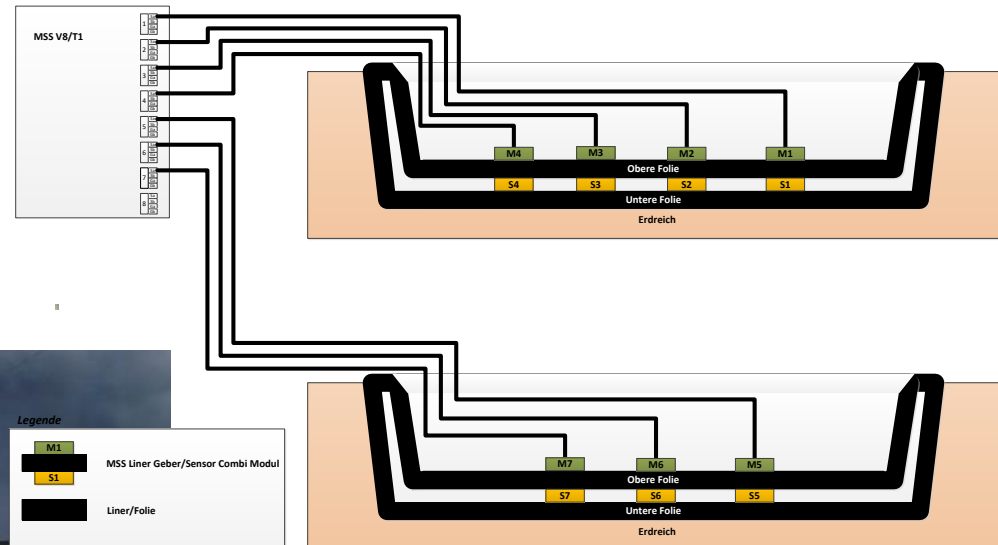
Example: Conductive Double Liner

- Mining Plant, Chile
- Storage of liquids with pH 1,2
- Installation in 2018/2019
- 2 basins: 15.000 m² and 8.500 m²
- Double Liner - White Conductive by Agru, 2 mm
- 1 Central Unit, 2 Outdoor Cabinets
- 14 CombiModules, 10 outside sources



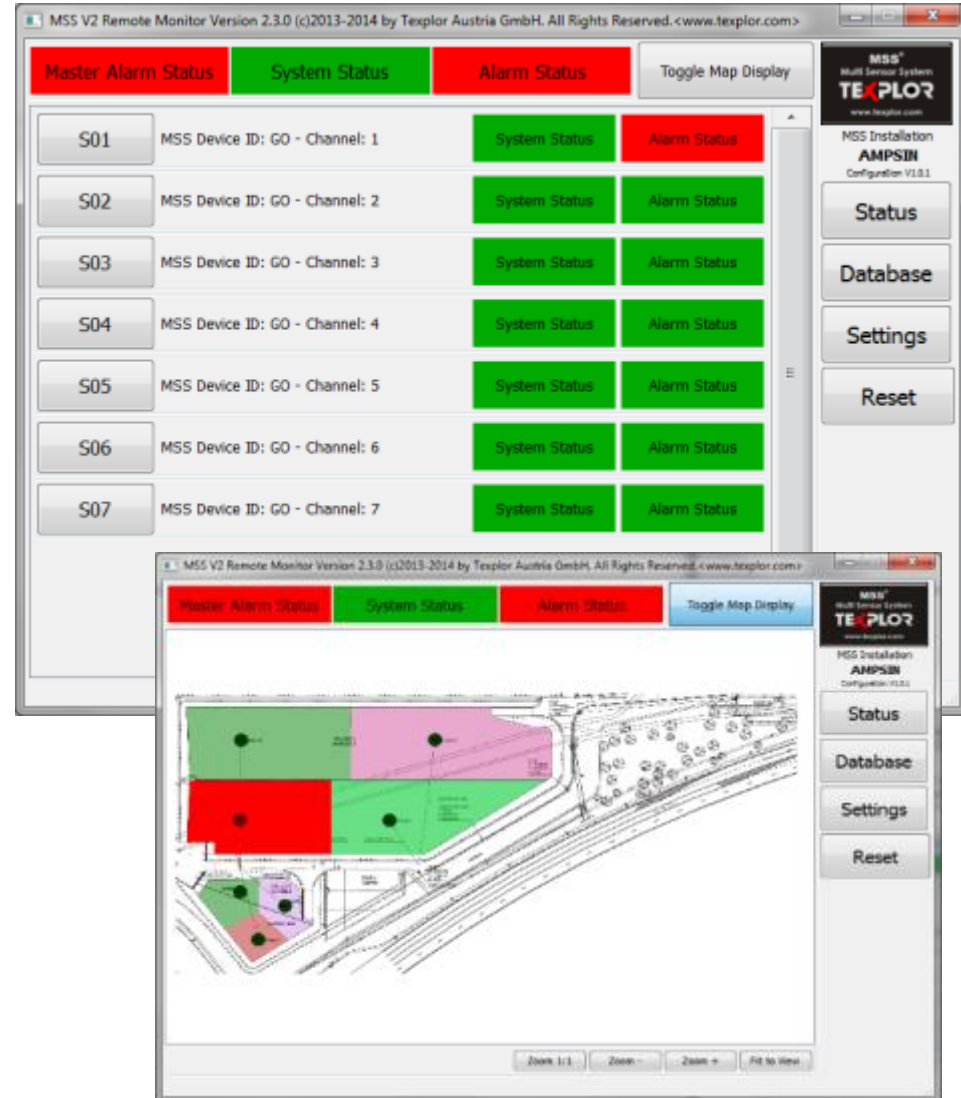
Example: Conductive Double Liner

- Storage of contaminated material, Belgium
- MSS® Monitoring + GSE LLL (Conductive Liner)
- In operation since 2014
- 1 Central Unit, 7 CombiModules
- 1 CombiModule covers 3.000 m²



Example: Conductive Double Liner - Leak Situation

MSS[®] Central Computer Unit
System shows alarm status at
CombiModule S01
(red block is flashing)



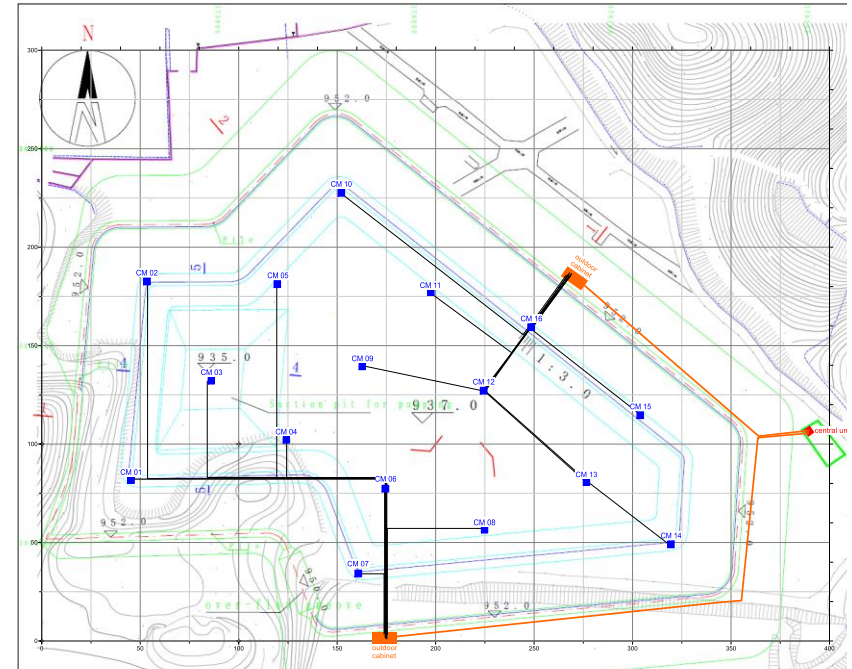
Example: Double liner & cover liner

- Mining Plant, Finland
- MSS® Monitoring of ore leaching basins (uranium)
- GSE double liner & cover
- In operation since 2013
- 1 Central Unit, 3 CombiModules



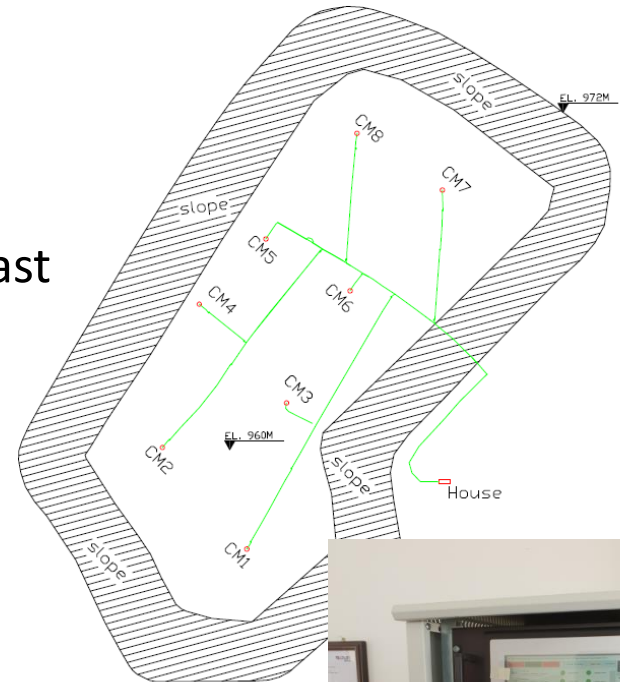
Example: Combination of Single Liner & Mineral Liner

- Fertilizer plant, Kailin, China
- 1 basin: 58.000 m²
- Storage of contaminated liquids
- HDPE Single Liner Construction with Trisoplast
- Installation in 2018
- 1 Central Unit, 16 TXSY Sensors



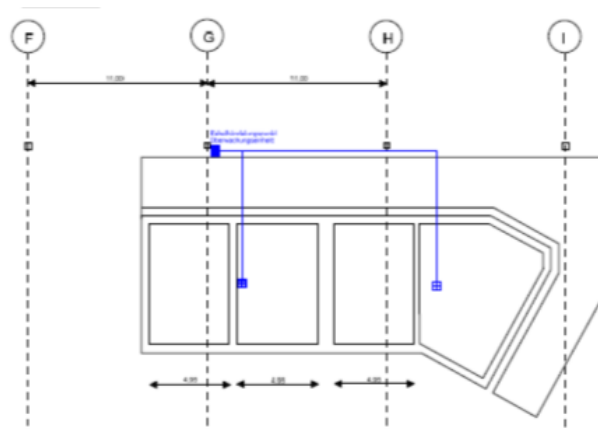
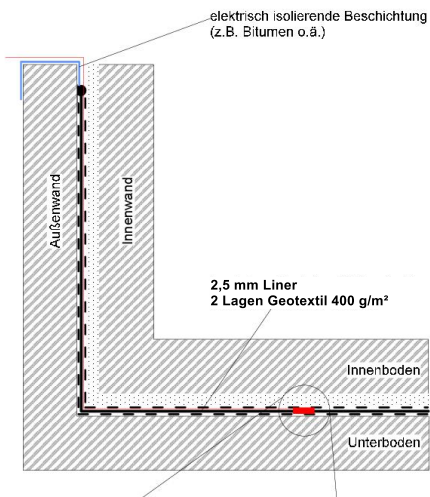
Example: Combination of Single Liner & Mineral Liner

- Fertilizer plant, Wengfu, China
- 1 basin: 36.000 m²
- Storage of contaminated liquids
- HDPE Single Liner Construction with Trisoplast
- Installation in 2018
- 1 Central Unit, 8 TXSY Sensors



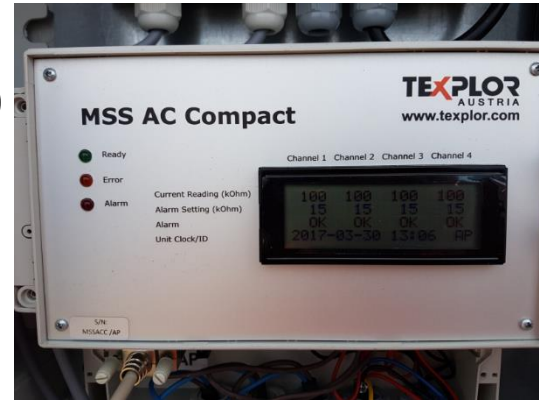
Example: Tight / Untight Monitoring for small installations

- Copper Processing Plant, Hamburg, Germany
- double concrete wall basins
- GSE LL Liner
- 2 Basins: tight – untight leakage control
- In operation since 2015
- 1 Central Unit (MSS® AC Compact)
- 1 MSS® CombiModule per basin



Example: Tight / Untight Monitoring for small installations

- OCI Petrochemical Plant, Texas, USA
- Storage of aggressive chemical liquids
- Conductive Liner, 500 m²
- In operation since 2017
- Permanent tight – untight control
- 1 Central unit (MSS[®] AC Compact)
- 1 CombiModule



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