TAL-Integrity Improvement Initiative (TAL-III)

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TAL
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TAL-Integrity Improvement Initiative

Presentation overview:

(1) Background of TAL-III-program

(2) Scope and set-up of program

(3) Projects of the TAL-III-program

(4) Actual program status and outlook

(5) Conclusions and lessons learnt

1) Background of program (1)

Some TAL-facts:

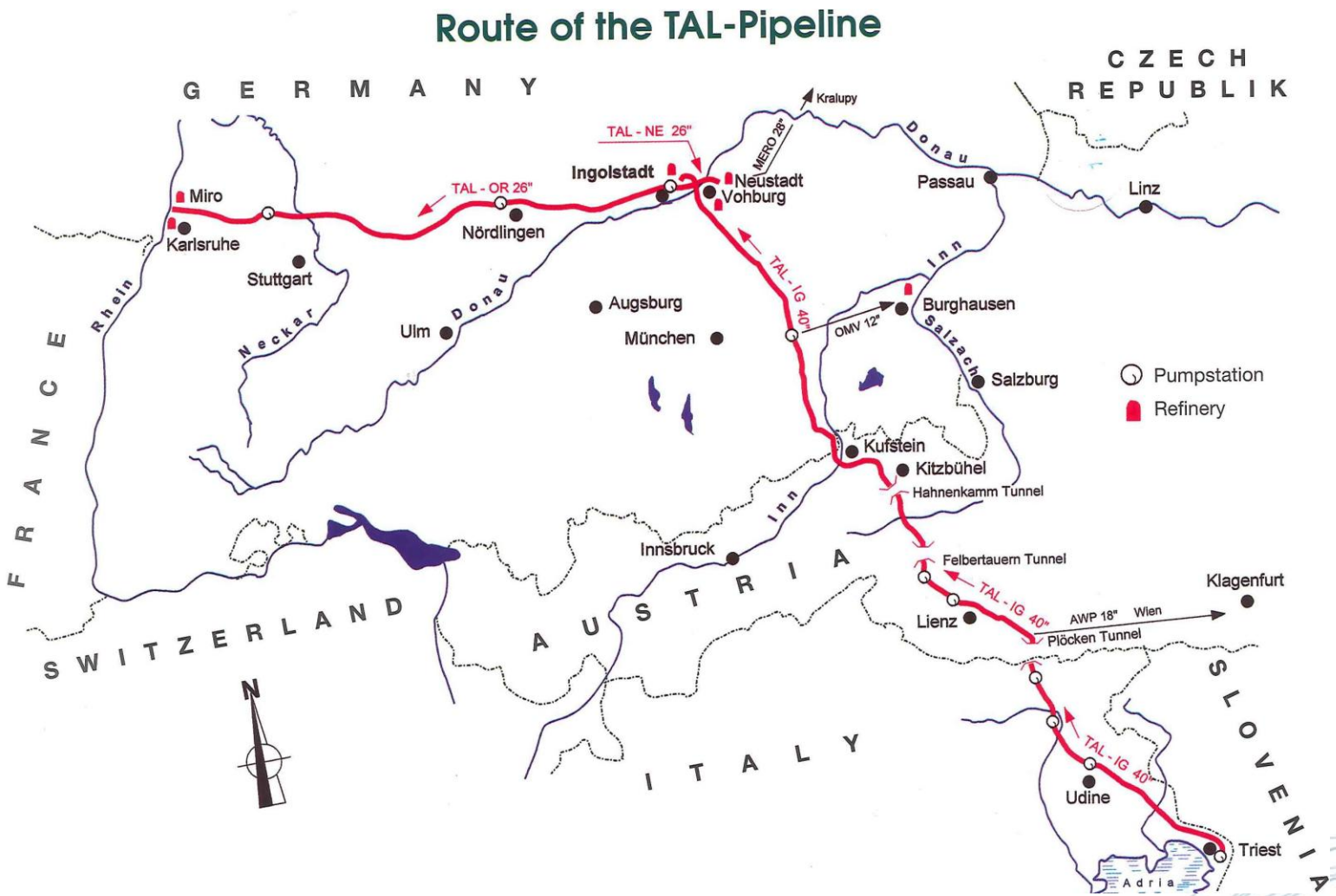
- TAL was built nearly 50 years ago to create a strong reliable crude-oil-feeding-system for central European refineries

- TAL supplies nowadays 8 refineries and covers crude supply of:
  30% of Germany, 90% of Austria and up to some 50% of Czech Republic.

- With actually yearly throughputs of 41 mio.to of crude-oil (close to nominal capacity of 43 mio.t) and a system length of 750 km TAL belongs to the largest crude oil supply systems in Europe

- TAL has proven to be a reliable and safe system of crude-oil transport in Europe for nearly five decades although facing new challenges

1) Background of program (2)



1) Background of program (3)

Driving factors initiating the program:

- In the last decade signs appeared indicating that the general technical integrity of the ageing pipeline system requires further investigations
- Some small and medium leakages occurred in tankfarms and stations between 2006 and 2008 (mainly related to ageing, corrosion and mechan. failures)
- Some severe defects were found in local station piping (drainage-piping, low-throughput-lines)
- Experiences of other pipeline-operators on ageing pipelines proofed the need to re-evaluate integrity-status of TAL-system

1) Background of program (4)

Main goal of the program:

This program was set up in 2008 for 3 main reasons:

- **to identify deficiencies of the system**
- **to implement mitigation measures**
- **to secure the asset value and the long-term availability of the system**

-> TAL-Integrity Improvement Initiative (TAL-III)

2) Scope and set-up of program(1)

Since 2006 several studies (with experts and engineering consultants) have been performed in order to identify the crucial measures to be taken.

General results of these investigations were:

Mainlines of the system (if piggable) seemed to be well monitored as well as the supervision of tanks/storage facilities

Some weak points identified were:

- Inspection of (so far) non-piggable-lines (Transferlines, Tankfarmlines)
- Inspection/supervision of station piping
- Containment and leak-control in manifolds and stations

2) Scope and set-up of program(2)

- Project was confirmed and approved by shareholders in autumn 2007; project-start in 2008
- 7 single sub-projects have been identified, summing up to an overall TAL-wide program, most of them covering 3 TAL-countries
- Project time-frame: more-years-projects 2008-2019, several projects with different (shorter) time-frame
- Project budget: overall project budget 112 mio.€, splitted and released in various project-related steps of execution
- Project-organisation: 7 project-managers report to an overall TAL-III-program-manager; project-steering-committee; Technical Working Group of shareholders; support by an external technical advisor (concept phase) and TAL-HSSE-manager

3) Projects of the TAL-III-program

7 Projects of TAL-III-program:

1. Piggability of harbour-/transferlines
2. Trieste Main Manifold revamping
3. Trieste Tankfarmlines Inspection program
4. TAL-wide check-station-piping-program
5. TAL-wide secondary containments program
6. Improvement of oil-separators/retention basins
7. TAL-wide improvement of gas/leak detection systems

3.a) Piggability of harbour-/transferlines (1)

Project background and goal of project:

- Trieste harbour- /transferlines built in the 1960ies
- 4 transferlines 42“, onshore; length 4,5 km each
  4 harbourlines 36“ offshore; length 800-1200m
- So far only the onshore 42“-transferlines were piggable by using removable pig-traps
- 36“-harbour-lines (offshore) along piers were not piggable and had to be inspected from outside with complicated scaffoldings along the piers
- Goal of this project was to install permanent pigtraps in Tankfarm Trieste in order to regularly pig transfer- and harbourlines

3.a) Piggability of harbour-/transferlines (2)

Technical solution was:

- Connection of two Transfer-/Harbourlines by installation of a loop at marine facility -> internal pigging of two Transfer-/Harbourlines in total length of 11km is possible within one shot

- Advantages: regular intelligent pigging and cleaning pigging is now possible on Transfer-/Harbourlines; combination of two lines for one inspection (dual-diameter: 36“/42“); installation of permanant instead of removable pig-traps; draining of lines with pigs in case of emergency is possible

3.a) Piggability of harbour-/transferlines (3)

Project data:

- Project executed in 2009/2010
- Total project cost for 4 Transfer-/Harbour-lines: 2,3 mio.€
- Immediately after installation caliper- and metal-loss-pigging was performed in 2010/2011 on all lines; based on the results a rehabilitation program for Transfer-/Harbour-lines was set up.

3.b) Trieste Main Manifold revamping (1)

Trieste Main Manifold:

The Manifold area is approx. 100 x 50 meters and includes 125 valves and related pipe connections with different diameters (20” – 24” – 36” - 42”); valves and pipes forms a matrix structure for the highest distribution flexibility

3.b) Trieste Main Manifold revamping (2)

Background of project:

Trieste Main Manifold had to suffer some minor/medium oil-spills between 2006 and 2008

After several investigations and studies it was finally decided to choose the so called Unburied Main Manifold-solution – advantages:

- **Oil-tight secondary containment for the whole MM-area**
- **No cost for excavation to be foreseen in the future**
- **Safety and environmental risks are lower in case of a leakage**
- **the "leak scenario" is limited to a dripping from a pipe or from a gate valve O-ring shaft and can be detected at short notice**
- **Permanent accessibility for inspections and monitoring (removable connections)**

3.b) Trieste Main Manifold revamping (3)

Main goals are to ease the maintenance of the system in terms of inspection and to improve leak detection capability

The project foresees the construction of a concrete basin for the whole valves area; main features of the basin are:

-Concrete bottom and side walls for the piping system; max foreseen depth is 4.8 meters from ground level

-A shelter made of steel structures and external and internal piles.

3.b) Trieste Main Manifold revamping (4)

- **Handling facilities for materials and personnel:**

Three bridge cranes will be installed with an additional operating envelop of 5 meters on top of the basin length to allow the loading/unloading of spare parts from/to the adjoining rod.

- **Transverse catwalks will:**

- **allow the personnel to reach all the valves and**
- **support the cables connected to valves electrical actuators**

3.b) Trieste Main Manifold revamping (5)

A study was performed and brought up a detailed flexibility analysis of piping system (stress and deformation of piping system once it will be completely unburied, due to the carrying of oils at different temperatures and atmospheric temperature changes).
-> As a consequence the stress in the pipe must be contained by frames connecting the pipes to the side concrete walls.

3.b) Trieste Main Manifold revamping (7)

On the whole MM area:

- 414 piles for temporary support of pipes and valves
- 172 piles for shelter foundation
- 46 piles for cathodic protection of concrete
have to be drilled (presently 346 of 632 piles finished)

The construction will proceed in steps (stripes) in the way that only limited areas of the manifold are exposed.

Once the concrete slab is finished the piles supporting pipes and valves are cut and linked to the slab

As far as the construction will proceed also the shelter will be assembled.

3.b) Trieste Main Manifold revamping (10)

- Construction completion is now foreseen at end of year 2015
- Total cost in the range of 10 M€

Investigation on construction of a new manifold brought up estimated cost of 20 M€ and very strong operational restrictions during erection

3.c) Trieste Tankfarmlines Inspection program (1)

Background of project:

- 18,6 km of 42“-tankfarmlines connecting main- and sub-manifold with 32 storage-tanks in Tankfarm Trieste (low-pressure lines – 10-12 bar)

3.c) Trieste Tankfarmlines Inspection program (2)

- Before start of the project only 6km of these lines were inspected at least once since operation-start (selected sections acc. to risk evaluation done in the 1990ies)

- By a more-years-program within 2008 and 2019 all sections of Tankfarmlines should be inspected at least once and based on the results an ongoing repeated inspection program for the future will be set up

- Inspection should be combined with repair and rehabilitation of lines in order to safe the asset value for further operation

- Program also comprises the inspection of piping in main- and sub-manifolds of the tankfarm Trieste

3.c) Trieste Tankfarmlines Inspection program (3)

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Inspection method:

- **Sectional line cuts, cleaning, sand-blasting, internal inspection, rehabilitation by internal epoxy coating in 5-7hrs-section (full coating of total inspected line-lengths)**
- **Checks on external corrosion are done by using an MFL-pigging tool pulled through line sections**
- **Pipe-repairs on heavier corroded sections (if required)**

3.c) Trieste Tankfarmlines Inspection program (4)

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Inspection results:

- Mainly internal corrosion was found spreaded along line in 6-o'clock position reaching local levels of up to 50% of wall-thickness loss,

- corrosions scattered and mainly concentrated in local deep-points, so far no channelling corrosion

- Internal coating-whereever applied so far- could perfectly help to stop or mitigate internal corrosion development in 6 o'clock-position and will therefore be further applied as preventive measure along all inspected line-sections

- Few repairs performed on local singular deeper internal corrosion spots at welds or fittings to be cut-out

- So far – beside some local superficial indications – no severe external corrosions were found in inspected tankfarmlines

3.c) Trieste Tankfarmlines Inspection program (5)

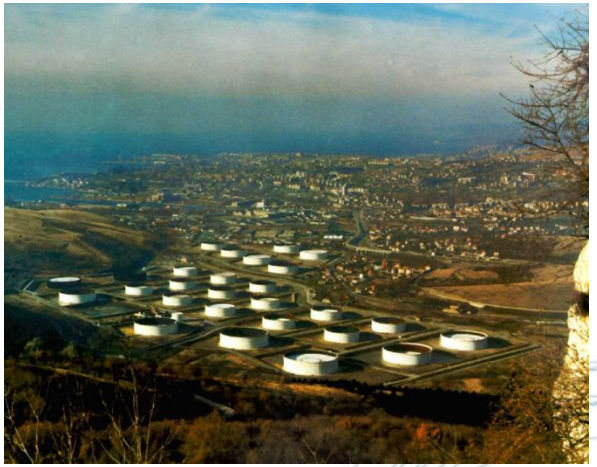
Evaluation of program by German TUEV:

- **Inspection-program was set-up with TUEV based on statistical and risk-based approach in order to keep an asset-limit of at least 50% of wall-thickness**
- **Inspection results are evaluated every 2 years together with TUEV in order to define priority of line-inspections and revise the program**
- **So far inspection results comply well with assumptions based for inspection program set-up**

3.c) Trieste Tankfarmlines Inspection program (6)

Program status:

- Every year some
  1,5-2km of
  Tankfarm-line is inspected
- By end of 2013: 76% of all tankfarmlines in TR were inspected at least once since operation start (meaning 14,2 km of 18,6 km total Tankfarmline-length)
- Estimated completion of the program in 2019
- Amount spent so far within the project: 6,9 mio.€
  Overall program budget expected at 18,8 mio.€



3.d) TAL-wide check-station-piping-program (1)

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Background situation:

- Minor oil-spills in 6 o‘clock drainage piping in TF-Trieste and at an insulating joint in relief station Mittersill/Austria between 2006 and 2008
- Station piping investigation was identified as weak point in the studies performed
- In Austrian stations a first initiative on a check-station-piping-program was started in 2000; in Germany this program was mainly driven by the new permit applications, asking for a complete evaluation of integrity-status of station-piping
- In 2008 this issue was defined as a TAL-wide „check-station-piping-program“ aiming the complete inspection of all station-piping along TAL-mainlines in all 3 TAL-countries

3.d) TAL-wide check-station-piping-program (2)

Inspection sites:

Huge excavation areas

in line-stations

and sub-manifolds

3.d) TAL-wide check-station-piping-program (3)

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Inspection methods:

- Pressure-testing
- Ultrasonic testing (mechanised/manual)
- Guided waves technology
- MFL-pipescanning/Slofec (Eddy current)
- Magnetic particle testing for weldings
- Permanent UT-sensor-installations

3.d) TAL-wide check-station-piping-program (4)

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Inspection results:

- Severe internal corrosions in 6 o'clock -position of drainage-piping
- Severe internal corrosions in suction-side pump-headers
- Internal anodic corrosion of insulating joints
- Superficial external corrosions on several pipe-sections
- Manufacture-related and superficial cracks in or at welds have been found on several pipes

-> some of these defects led to pipe-exchanges or rehabilitation measures

-> all excavated/inspected piping in station was newly coated with state-of-the-art insulations

3.d) TAL-wide check-station-piping-program (5)

Project status:

- Germany: program finalised on TAL-IG and TAL-OR-mainlines in 2013 and on TAL-NE- mainline in 2014
- Austria: program will be finalised in course of secondary containment-project by end of 2016
- Italy: program will be finalised in 2016

Total estimated project cost: 10 mio.€

So far spend amount: 7,5 mio.€

Project had to be rescheduled due to resources restrictions and heavy conditions found onsite (groundwater-situation, heavy foundations, asbestos-issue of coating,…). These facts caused higher cost than originally planned and a prolongation of the project from end of 2014 to end of 2016.

3.e) TAL-wide secondary containments program(1)

Background of project:

TAL's existing design to have many of installed flanges and fitting buried, is no longer state-of –the- art anymore for Western European Pipelines (adaptations have already been performed by other pipeline-operators)

Project also derives from a requirement of German Technical Rules for water hazardous substances

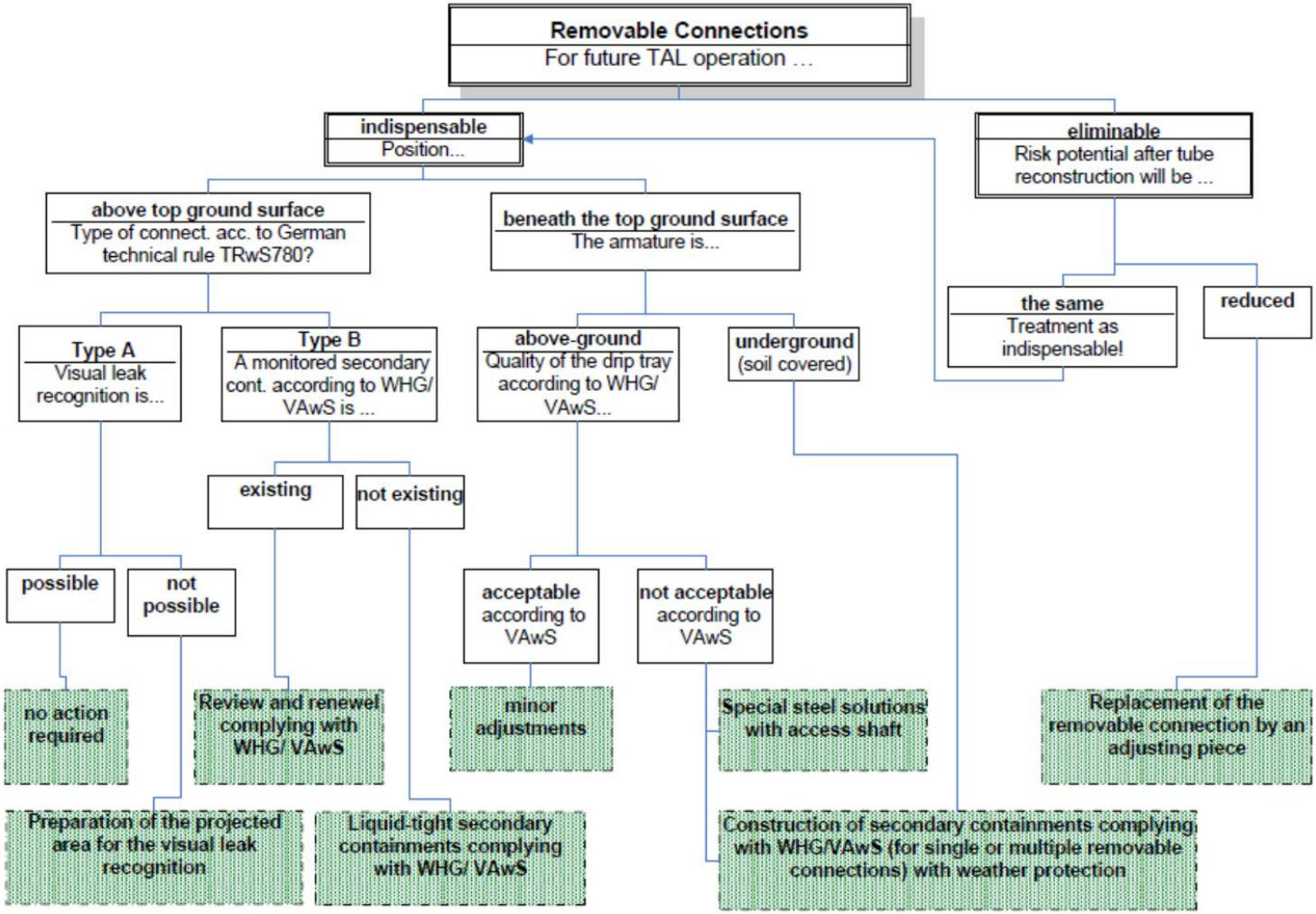
-> due to permit-renewals for German pipe-sections existing installation had to be adjusted to state-of-the-art-design

What are "removable connections"?
Piping compounds to be removed from each other without damaging

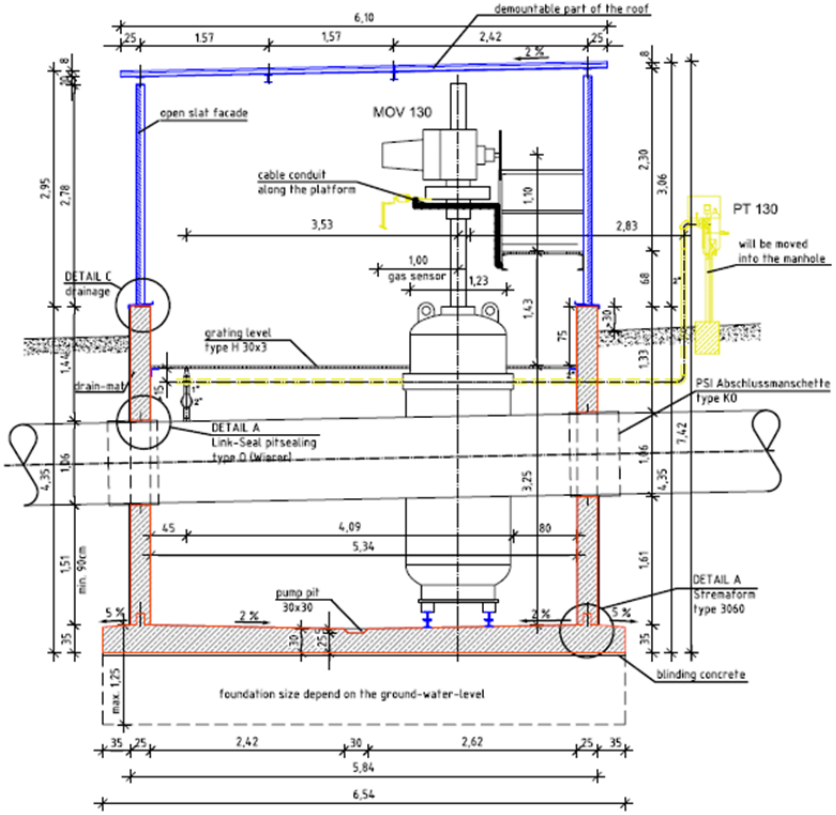
When are removable connections considered as secured ?

- when drip leakage/ leakage are excluded by special technical arrangements
- when drip leakage/ leakage are locally harmless retained

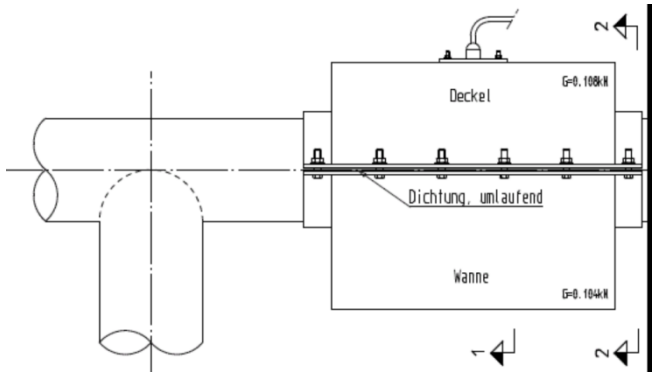
3.e) TAL-wide secondary containments program(2)



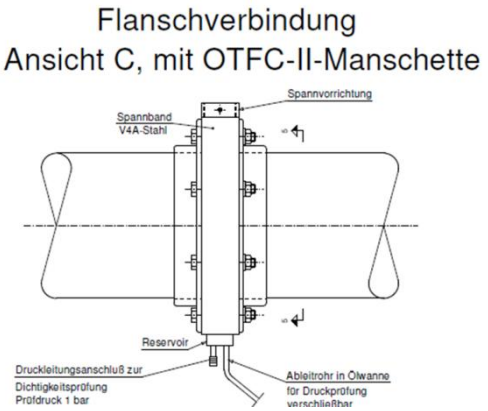
3.e) TAL-wide secondary containments program(3)



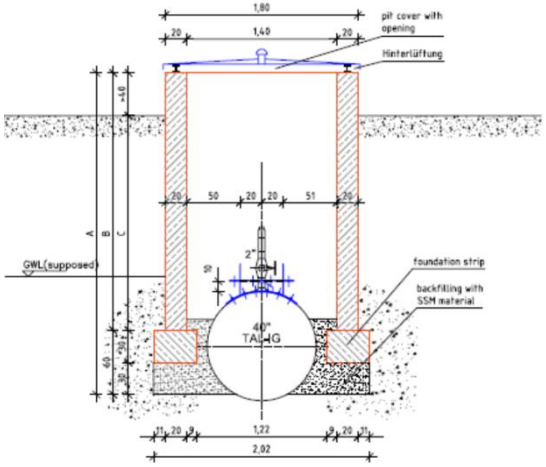
3.e) TAL-wide secondary containments program(4)



RWSC – **R**emovable **W**atertight **S**econdary **C**ontainment

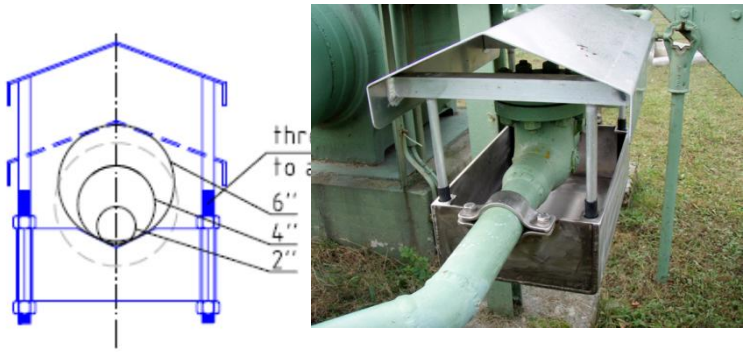


OTFC – **O**il **T**ight **F**lange **C**over



ST-12_AS 130 Molchmelder-Bild3

APC – **A**dhesive **P**ipe **C**ontainment



RCSB – **R**oofed **C**over **S**teel **B**ox

3.e) TAL-wide secondary containments program(5)

3.e) TAL-wide secondary containments program(6)

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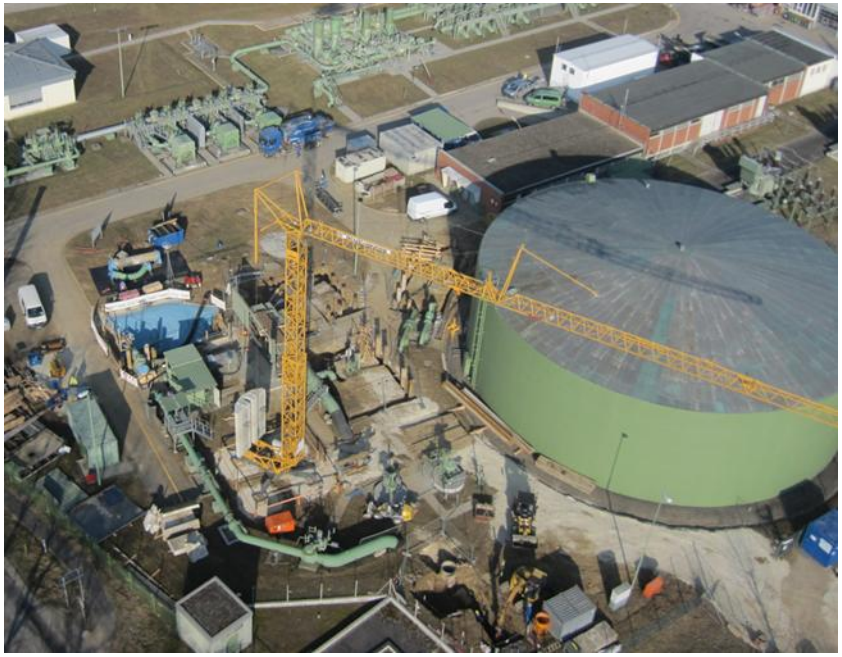
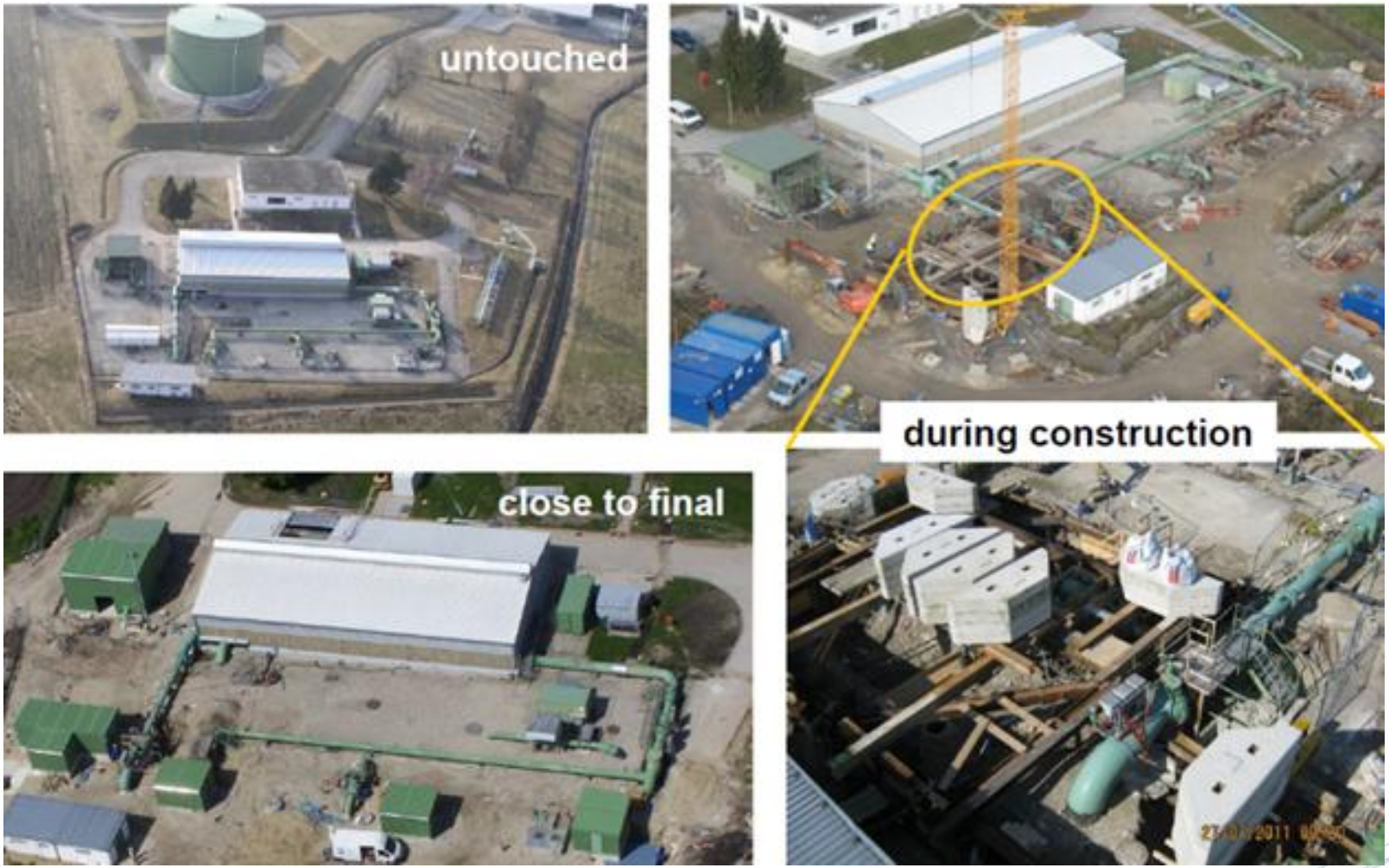
TAL-Germany: between 2011 and 2013: 43 stations, 940 removable connections, 60 shafts new or adapted, 3 valve-relocations, approx. 130 steel-containments,

Budget spent: some 28 mio. €



3.e) TAL-wide secondary containments program(7)



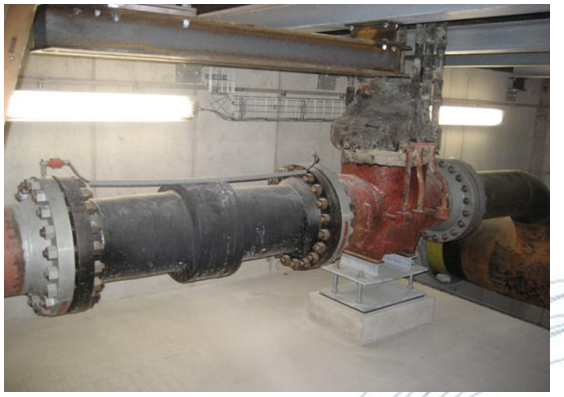
3.e) TAL-wide secondary containments program(9)

Project goal and set-up:

-> to protect soil and water against hazardous substances by potential dropping leakages of removable connections

- **Germany: finalised up to end 2013 for TAL-IG/OR and 2014 for TAL-NE**
- **Austria: program starts 2014 with valve-stations and is planned to cover all Austrian stations by end of 2016**
- **Italy: program already started with some local installations and continues until 2016/17**

Overall project budget: 77 mio.€; so far approximately half amount of this budget has been spent on the project



3.f) Improvem. of oil-separators/retention basins

Background situation an project set-up:

- Experiences of Trieste leackages 2006/07 and legal compliance checks in Austria revealed the requirement to improve local oil-separators and retention basins, having been in operation since the 1960ies in various Italian and Austrian stations

- The project was carried out between 2008 and 2011 in Tankfarm Trieste, 2 Italian and 7 Austrian stations, covering an overall budget of 1,4 mio.€

3.g)TAL-wide improvem. of gas/leak-detection systems

Background situation:

- Based on the leakages of 2006-2008 it was evaluated that in several stations state-of-the-art gas-/oil-detection-systems were missing (ILF-study done)

- TAL-wide program was set up in order to exchange old or install additional state-of-the-art gas-/oil-detection-devices in various stations in all 3 TAL-countries

  -> the execution of the project is done in course

  of the secondary containment project

- In an initial project the oil-containments for gas-/oil-detection-devices of tank mixers in Tankfarm trieste were improved in the years 2008 to 2009

4) Actual program status and outlook (1)

TAL-III - Actual program status:

- Program is presently in half-time of execution and will be continued until 2019
- Some single projects of the program have already been closed (piggability of Transferlines; improvement oil-separator-/retention-systems)
- Some single projects will probably last longer than originally planned due to operational restrictions, unfavourable conditions and workload capacities (Tankfarmlines inspection, Check-station-piping)
- So far on the whole program a budget amount on (open and posted) services and deliveries of more than 60 mio.€ have been spent (total estimated project budget of 112 mio.€); budget approvals by shareholders for the program-budgets are done according to execution status by yearly CAPEX- and OPEX-budgets of TAL-companies

5) Conclusions and lessons learnt (1)

- **Project measures taken so far led to a visible improvement in integrity-status of the assets - > no severe spillages related to ageing piping facilities since start of the TAL-III-program**

- **The set up of this program was essential for long-term reliabilty of TAL-assets and creates trust and confidence at local communities and authorities that TAL takes serious its responsibility towards local people, safety-issues and environment**

- **Due to the big amount of work to be done it was essiential to choose the right approach in order to priorize works and split work-load to more-years-programs**

  -> in order to reach this goal careful investigations on root causes were done and external expertise support was requested and provided;

  in some cases risk-based approaches were chosen

  in order to prioritise works to be done

5) Conclusions and lessons learnt (2)

- **It is really a challenge to run a program of that size beside the normal daily business and the regular maintenance and investment budget program of the pipeline**

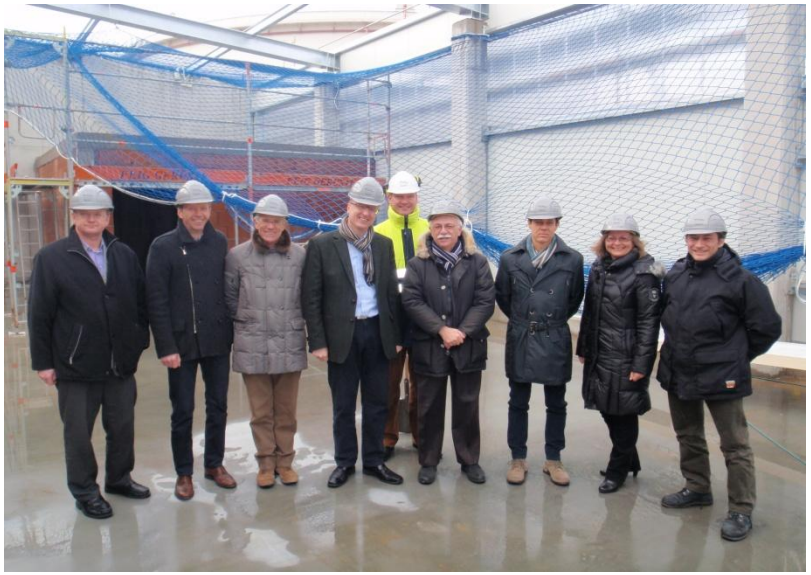
- **Execution of a program of that size requires additional internal and external resources**

- **Project-management tools in order to professionally organize and monitor the overall program and the single projects are essential**

- **Since 2012 additional challenges were given to TAL by increasing its yearly throughput by some 17% in order to fully supply Miro-refinery in Karlsruhe, to restart a refinery in Ingolstadt and to increase transported volumes to Czech Republic -> this new situation has a big impact on execution of projects and general maintenance regarding operational restrictions and required shut-downs of assets**

5) Conclusions and lessons learnt (3)

TAL-Integrity Improvement Project (TAL-III)



Despite the heavy work-load and challenges of such a large program it can be stated that TAL-III has surely improved integrity-status of TAL-assets and is to be seen as a great step forward in order to ensure the long-term availablity and reliability of the TAL-system as one of the major European crude-supply-systems

Thank you for your attention!

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