

Status of WT and related issues

C. Cattadori on behalf of working group

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Outline

- Status of WT construction and test
 - Static test
 - WT-Criostat flange
- Status of fast drain line
- Status of authorization to drain water from GERDA apparatus (LNGS)
- Status of water plant (to recirculate water in WT)
- Status of line from Borexino plant to GERDA WT



Completely constructed
on site

Construction: Completed
by end of June 2008.

6.1.6 *Caratteristica dei materiali*

I materiali impiegati sono i seguenti:

Per il serbatoio di acciaio

- Acciaio AISI 304
- tensione caratteristica di snervamento $f_{yk} = 241 \text{ N/mm}^2$;
- tensione caratteristica di rottura $f_r = 586 \text{ N/mm}^2$;

DA meeting

11-13 March 2008

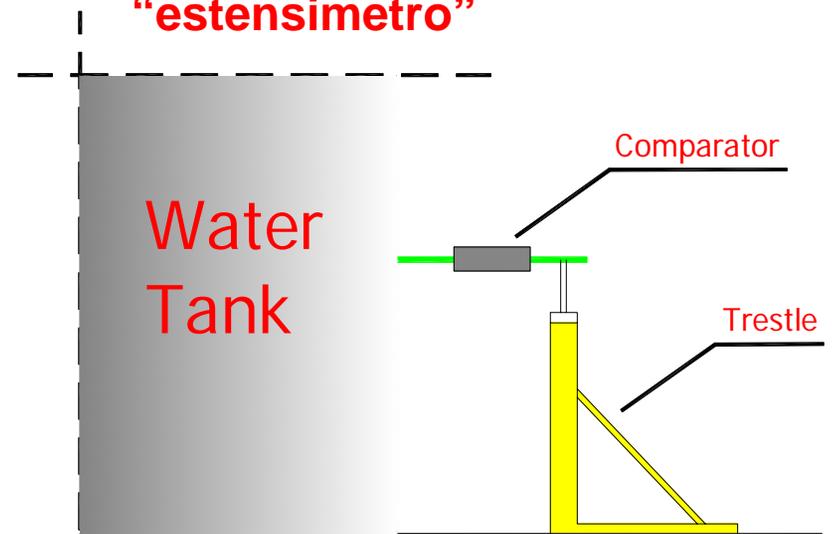
Static Test

- The static test has been performed checking that the radial deformations, measured varying the water column height, are below the displacements foreseen by the numerical model.
- The measuring instruments are 4 estensimeter having sensitivity of 0.01 mm.
- For the static test 3 centesimal “estensimetro” have been located on the WT mantle at 120° and 1 m height, + 1 instrument at 4 m height

**Centesimal
“estensimetro”**



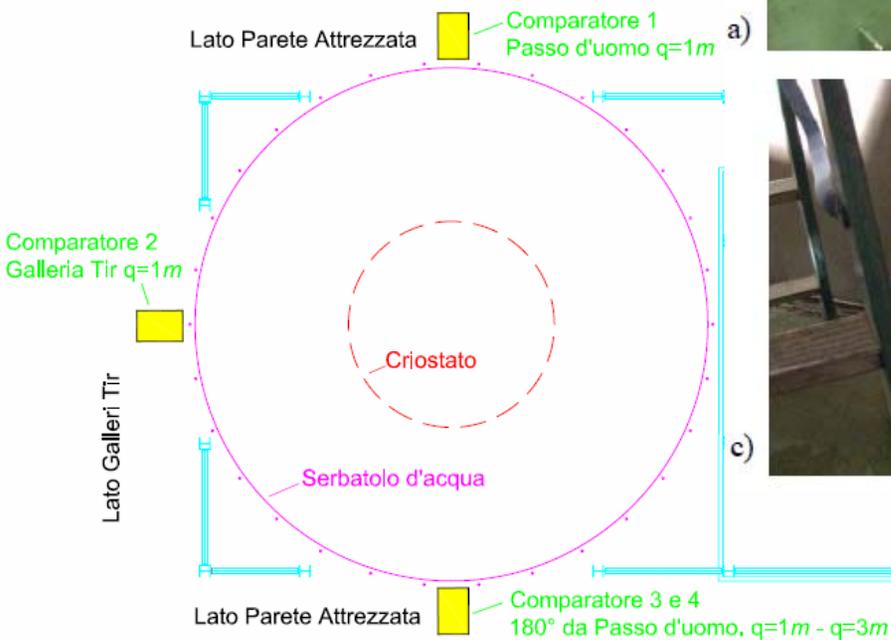
**Position of the
“estensimetro”**



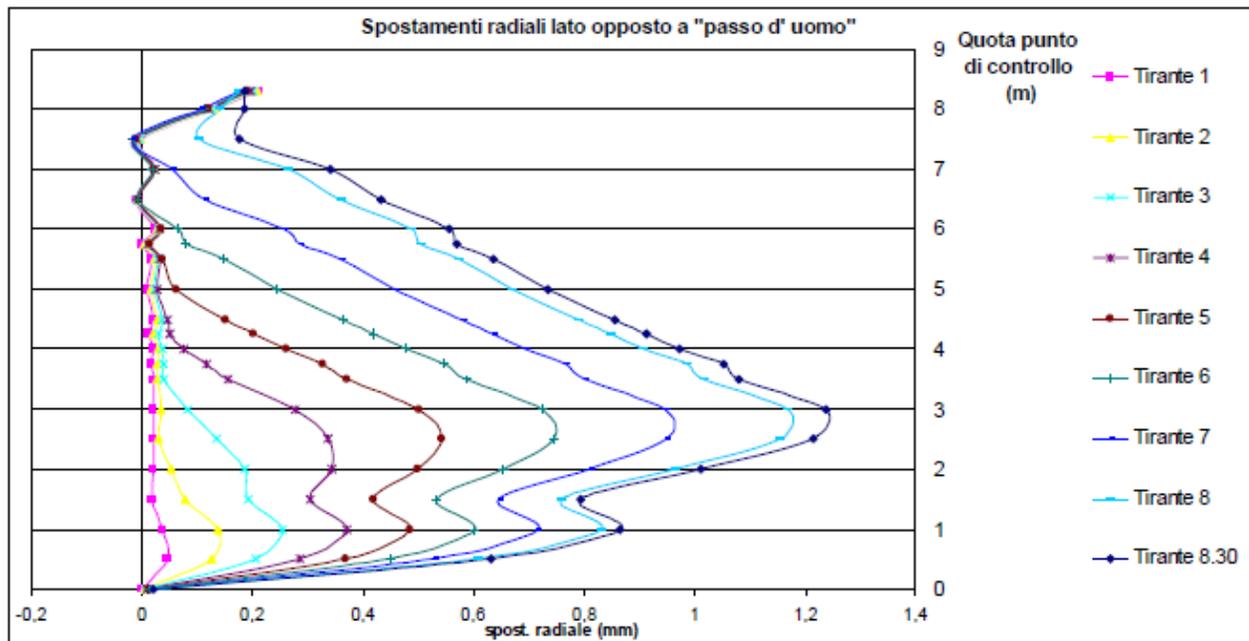
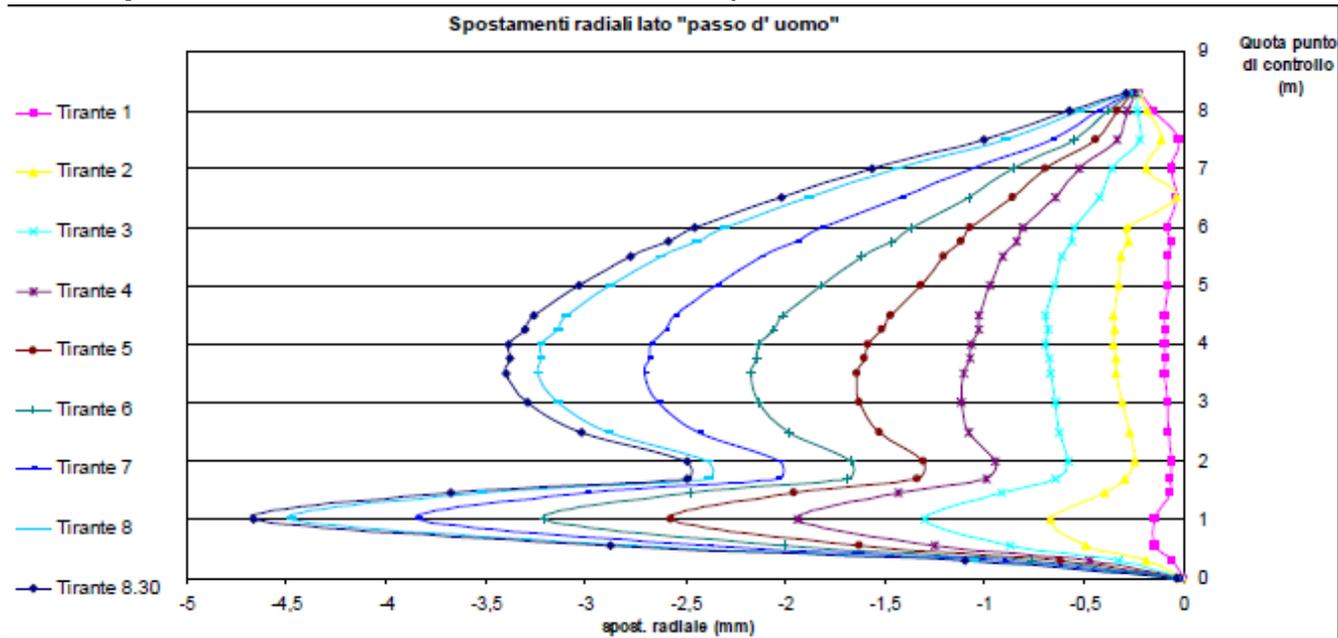
First filling and static test

- First filling started on 24th november 2008. H₂O from the U-lab fire extinguishing plant has been injected into the WT. The tank has been drained on february 2009

Schema posizionamento cor

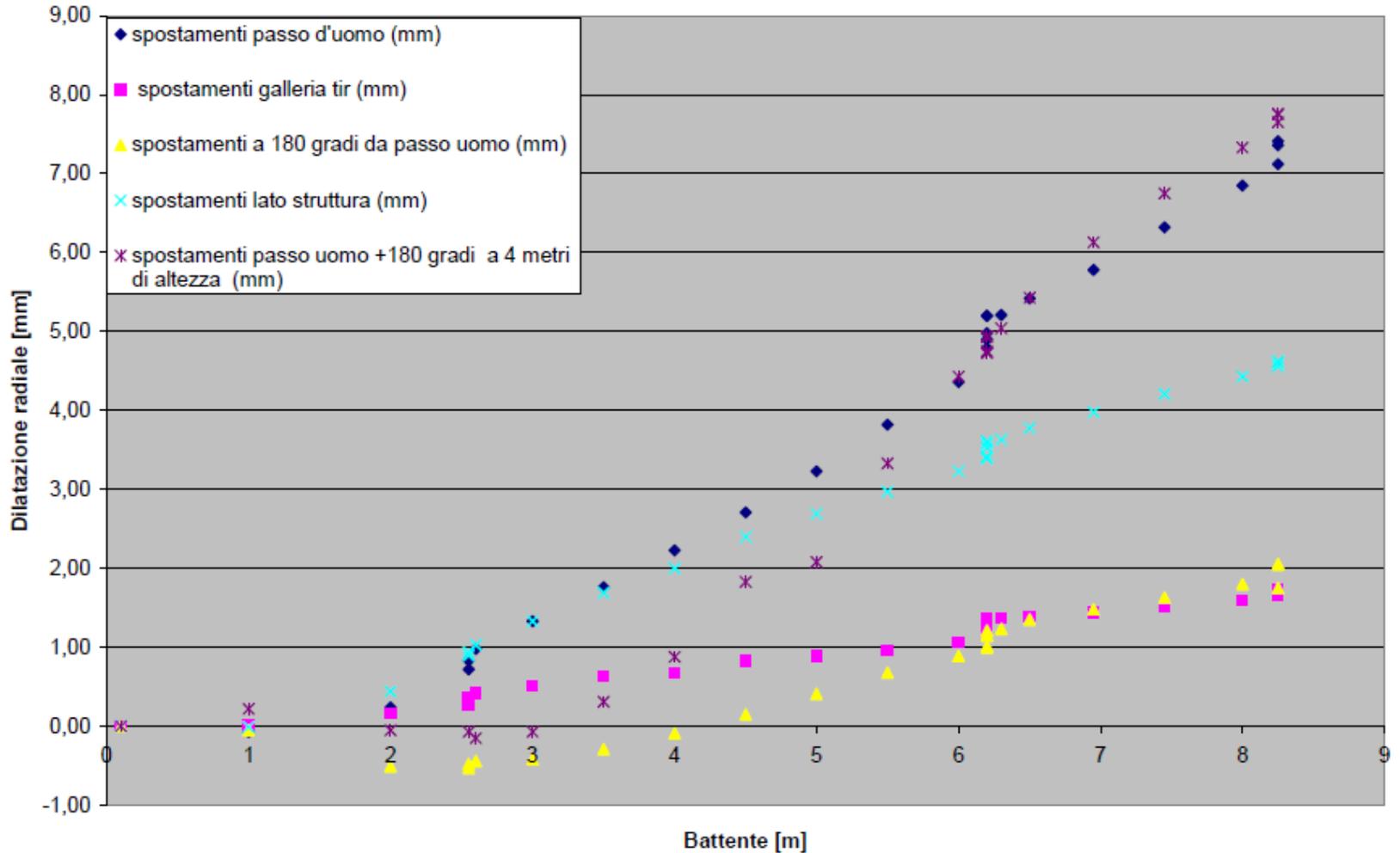


Expected deformations (from finite element analysis code)



Measured deformations

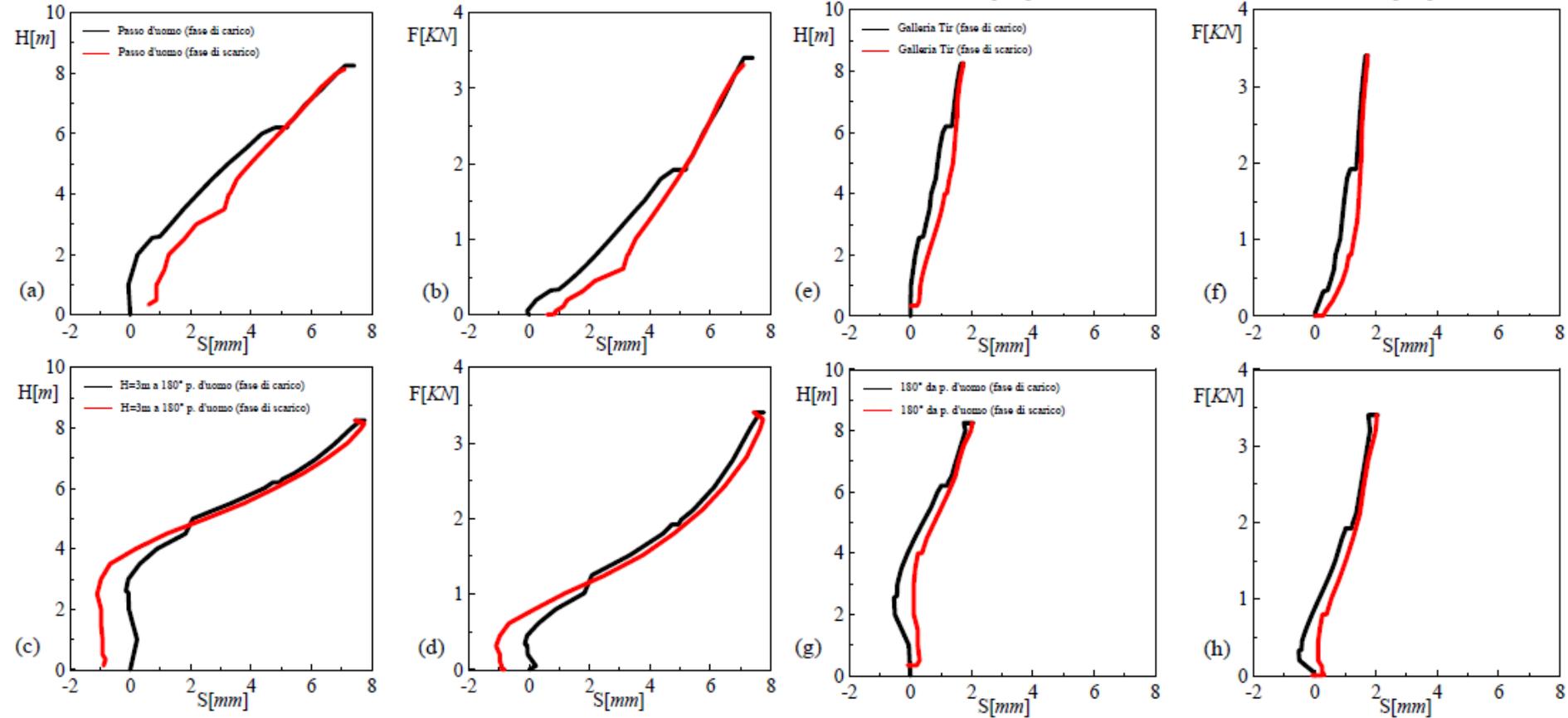
Dilatazione radiale WT



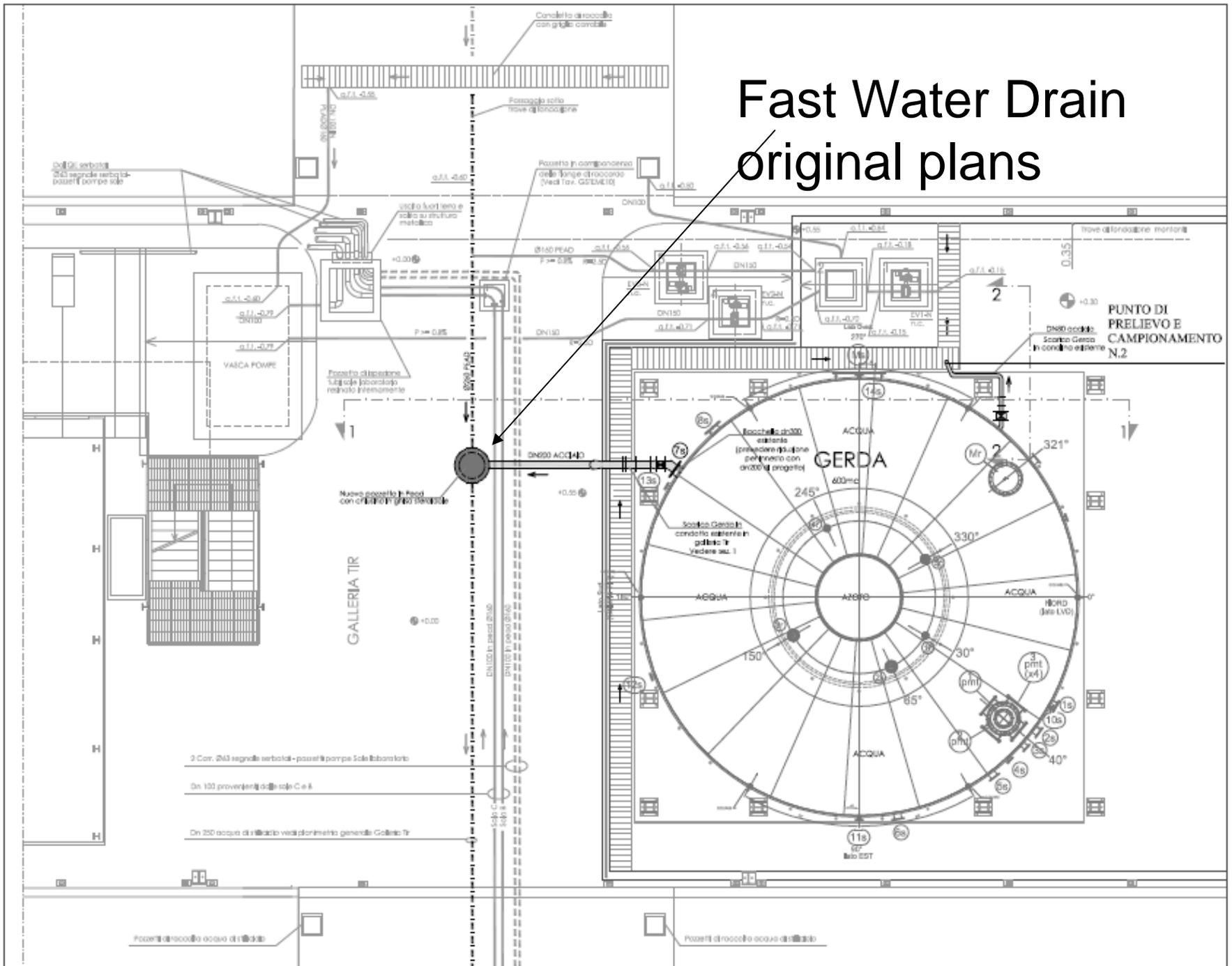
Measured deformations while filling and draining confirms that the tank deformations are in the elastic regime

black : filling

red: emptying

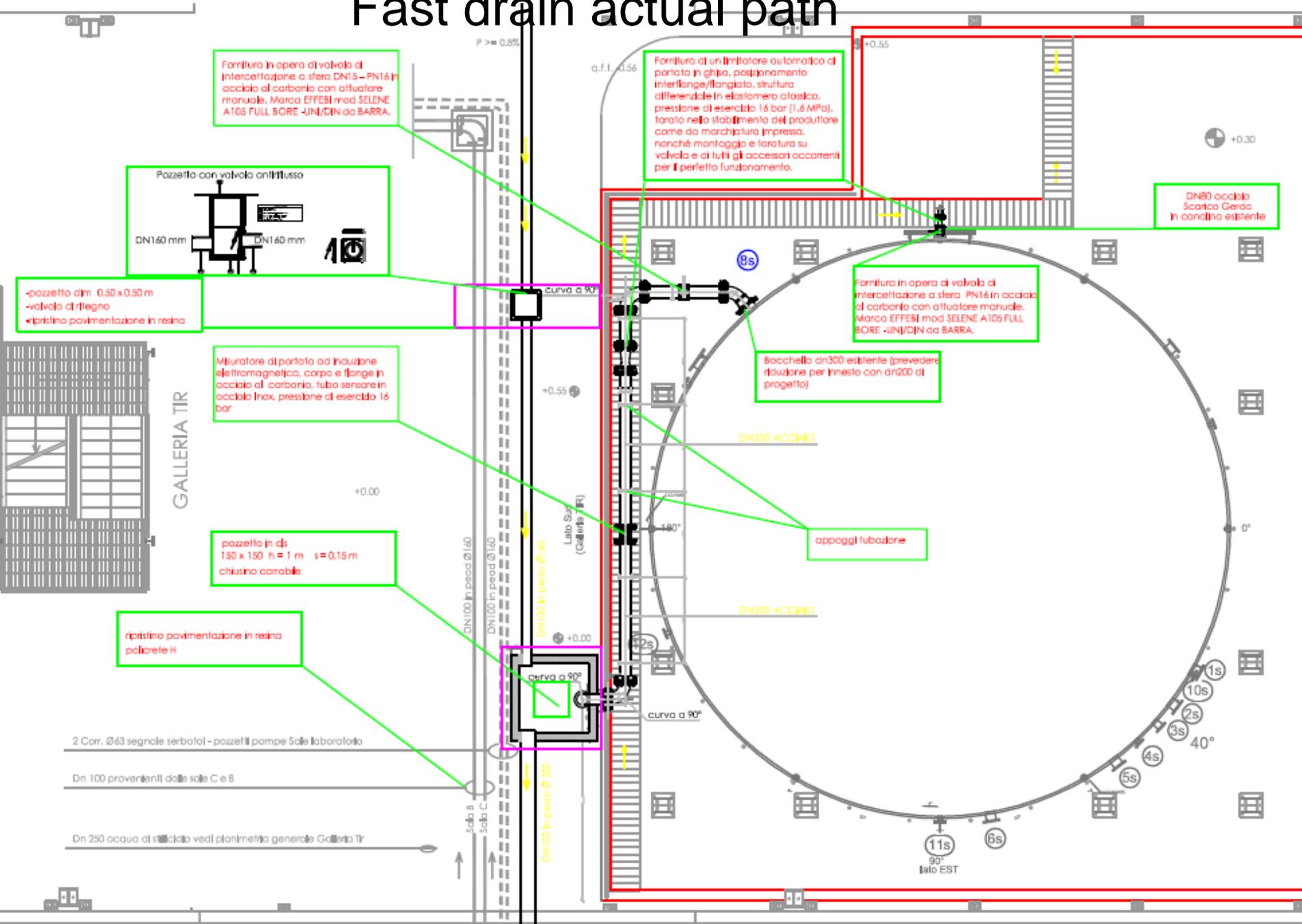


Fast Water Drain original plans



LABORATORIO "A" - SCALA 1:50

Fast drain actual path



Specifications of components along the 2 pipes: this configuration (completely passive devices) has been decided by LNGS technical staff

- **Flow limitation**: Limitatore automatico di portata in ghisa, (Marca OPPO) posizionamento flangiato, struttura differenziale in elastomero atossico, pressione di esercizio 16 bar (1,6 Mpa), tarato nello stabilimento del produttore come marchiatura impressa; DN 200
- **Flow limitation** :Limitatore automatico di portata in ghisa, (Marca OPPO) posizionamento flangiato, struttura differenziale in elastomero atossico, pressione di esercizio 16 bar (1,6 Mpa), tarato nello stabilimento del produttore come marchiatura impressa; DN 80.
- **Flow Meter**: Misuratore di portata elettromagnetico, (Marca OPPO) corpo e flange in acciaio al carbonio, tubo sensore in acciaio inox, pressione di esercizio 16 bar (1,6 Mpa), rivestimento interno in Teflon o ebanite alimentare, elettrodi in acciaio inox, centralina di conversione a microprocessore, menù guidato in linea con display a 16 cifre su due linee, grado di protezione IP 66, alimentazione 220 V, segnale in uscita 4-20 mA, flangiato e forato a norme UNI EN 1092-1. Diametro nominale 200 mm, Portata max 1130m³/h

- pipes in carbon steel
- To be installed:
 - TRONCO RIDUTTORE DN300/DN200 IN ACCIAIO INOX*
 - VALVOLA DN 150 PN 16 : Alfa 10 corpo e sfera in *AISI304* con leva tenute in PTFE+Vetro per temperature da -20 a +180°, pressioni di esercizio 5/6 bar
 - VALVOLA DN 80 PN 16 : Alfa 10 corpo e sfera in *AISI304* con leva tenute in PTFE+Vetro per temperature da -20 a +180°, pressioni di esercizio 5/6 bar



Status of authorization to discharge water from GERDA plant.

- LNGS sent out to Teramo Provincia the request for authorization on 6th June 2008. The authorization is STRICTLY related to attached executive technical drawings.
- Teramo Provincia required twice integration of documentation (indication of positions to take samples etc).
- Teramo Provincia instructed the folder and sent it for opinion to ASL and ARTA (authorities for health and environmental issues respectively), which answered positively (ARTA end of January 2009)
- Final authorization, expected by end of November 2008. (E. Coccia communication at SC meeting), from Provincia di Teramo not yet arrived. They are waiting the “collaudo” documentation of the full water drain system of the LNGS. The governmental commissioner has sent out this week documentation.
- E. Coccia private communication (yesterday): the authorization has been written must be signed End of the history. (hopefully)

EPDM flange between cryostat and WT constructed and put in place by Di Zio



- EPDM **rubber** (ethylene propylene diene M-class rubber) is an **elastomer** which is characterized by wide range of applications. The E refers to Ethylene, P to Propylene, D to diene and M refers to its classification in **ASTM** standard D-1418. The “M” class includes rubbers having a saturated chain of the polymethylene type. The diene(s) currently used in the manufacture of EPDM rubbers are DCPD (dicyclopentadiene), ENB (ethylidene norbornene) and VNB (vinyl norbornene).

Oxidation of WT inner surface and Cryostat external surface

- Due to improper management of the work site, the WT top flanges (manhole and PMTs chimneys) have been kept open during the construction of the super structure and closed only prior the WT filling → iron powder coming from cutting the superstructure gridded floor entered in the WT, and in contact with water made rust/oxide mainly on the WT bottom plate and on the cryostat shoulders. Minor oxidation spots on WT and Cryostat vertical surfaces.
- The problem was understood after inspection in the WT (12/02/09) after the draining of the water from first filling.
- Di Zio company did a visit ~ 15 february to evaluate the oxides.
- Di Zio company and SIMIC suggested a treatment that will be applied starting from 11/03/2009.
- In their evaluation the oxides are due to two different causes
 - iron particles deposited on the steel fell inside the tank during the building construction
 - Scratches in the steel plates by iron tools during the construction/transport of WT steel plates or cryostat transport.
- Important: the analysis of the water adopted for filling indicates very little content of chlorides.



Oxidation spot below top manhole before treatment

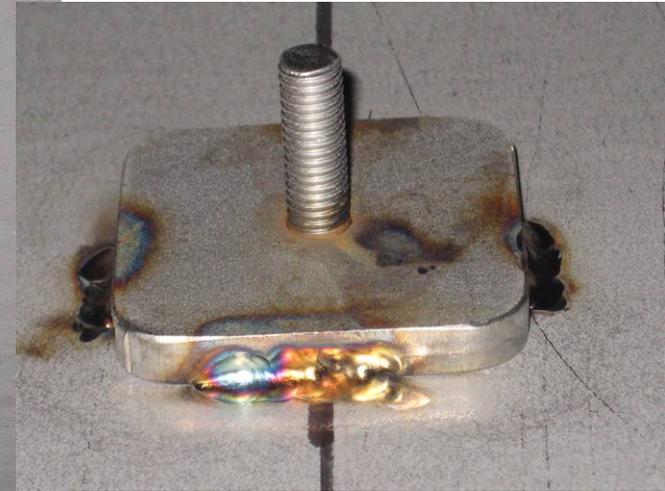
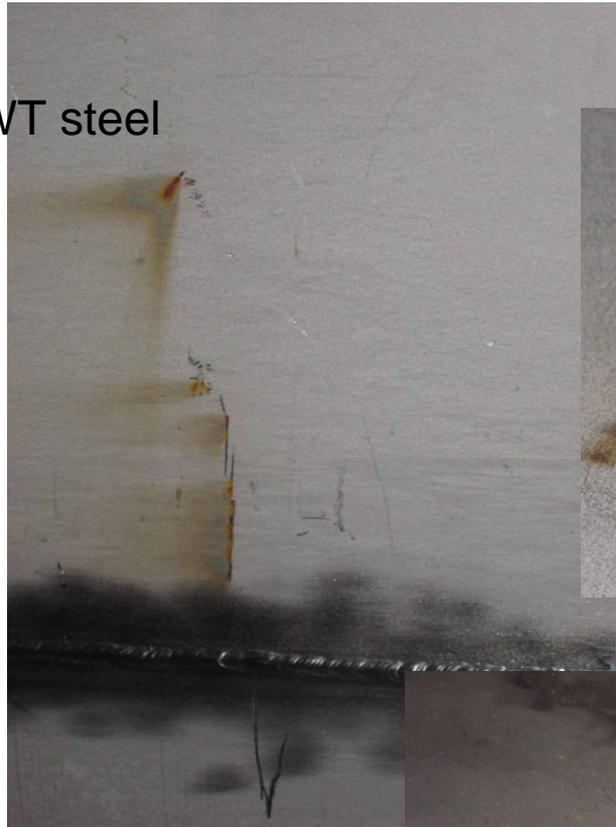
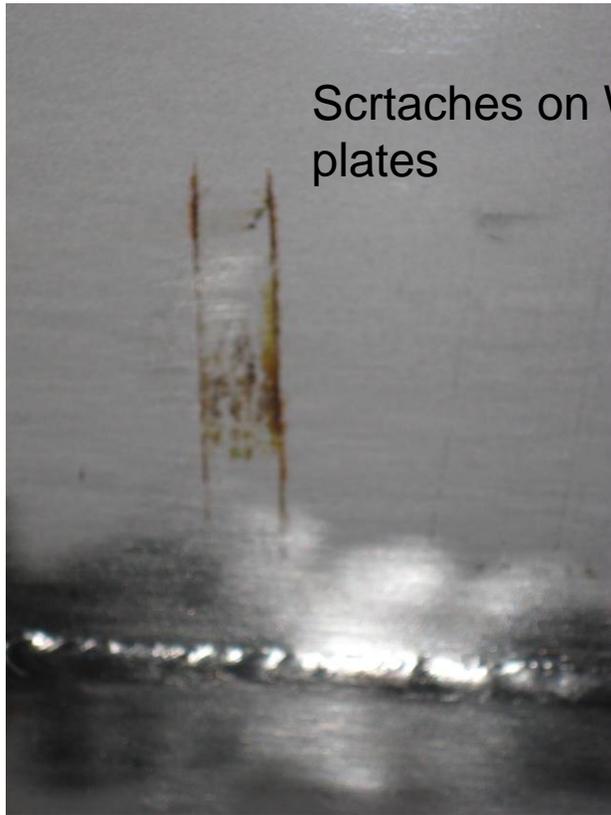
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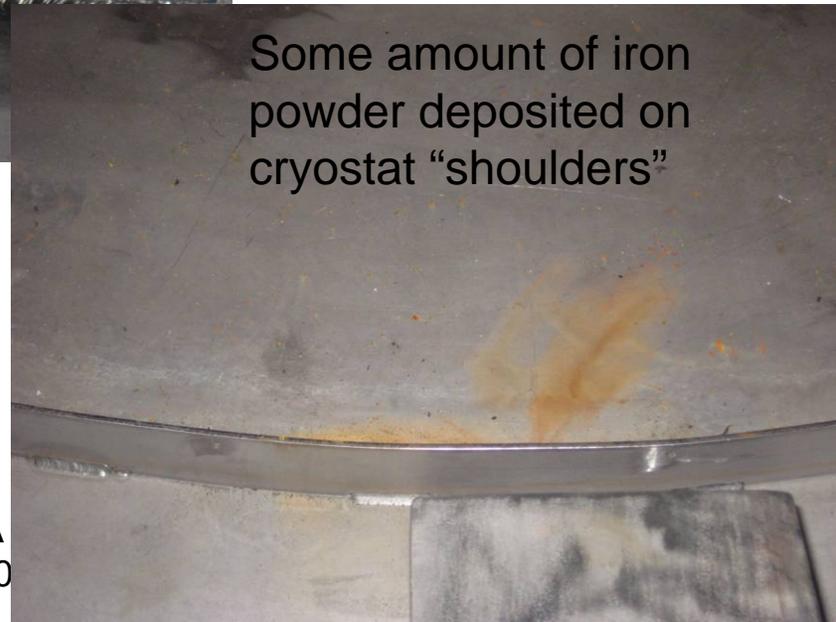


Oxidation spot below top manhole after treatment by REMOX

Scratches on WT steel plates



Some amount of iron powder deposited on cryostat "shoulders"



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Actions to remove the oxidations

- A pickling and passivation procedure to remove oxides, passivate and clean the WT internal and cryostat external surface has been defined agreed and submitted to LNGS SPP and approved.
- The WT floor will be treated completely by REMOX (pickling chemical).
- The Cryostat and WT oxidized scratches shoulders will be grinded
- Pickling: By AVESTA 601 product applied locally
- Passivation: By AVESTA 630 product. All the surfaces will be treated.
- Extracost: ~ 1 kEuro/day (for cleaning only). Responsibility of companies to some extent of the oxide problem (scratches).

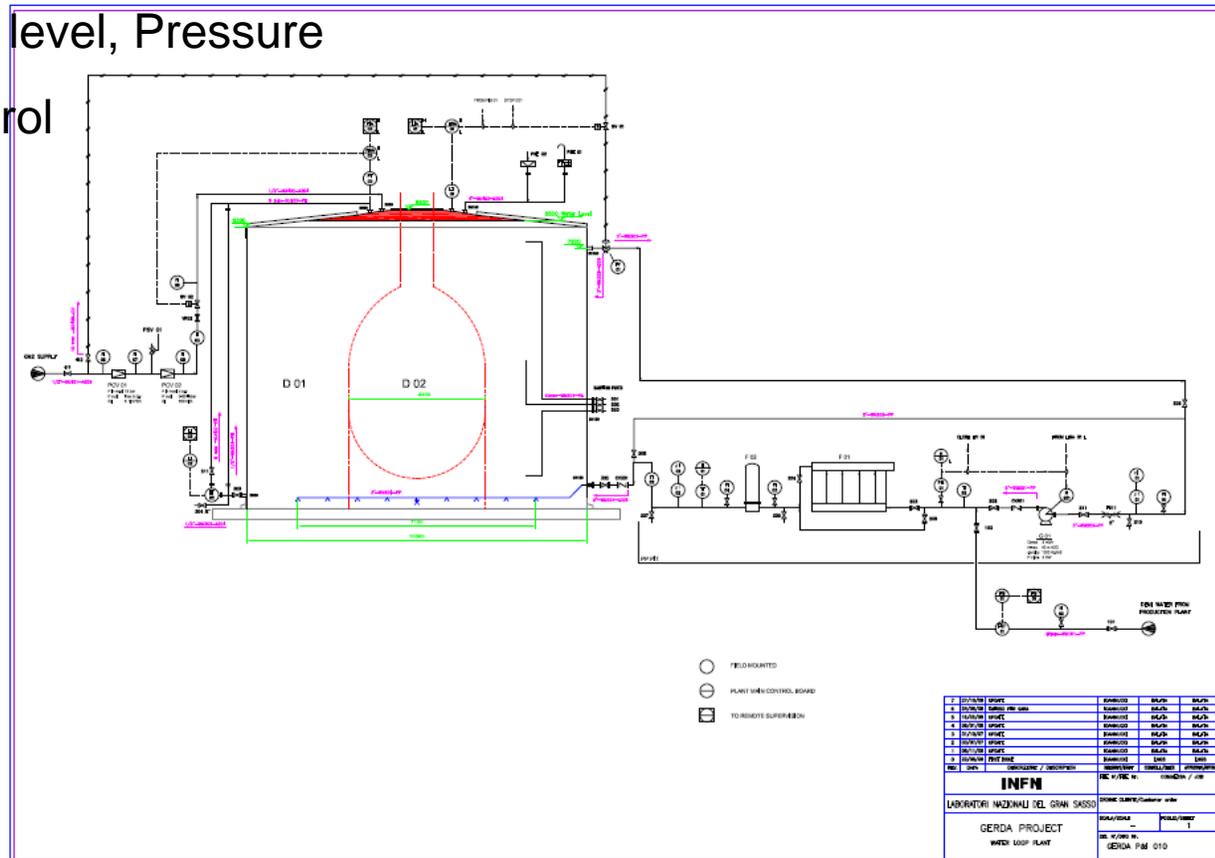
Water Plant

Assigned (August 2008) to Iniziative Industriali. Start of work by end of month (TBC by M.Balata)

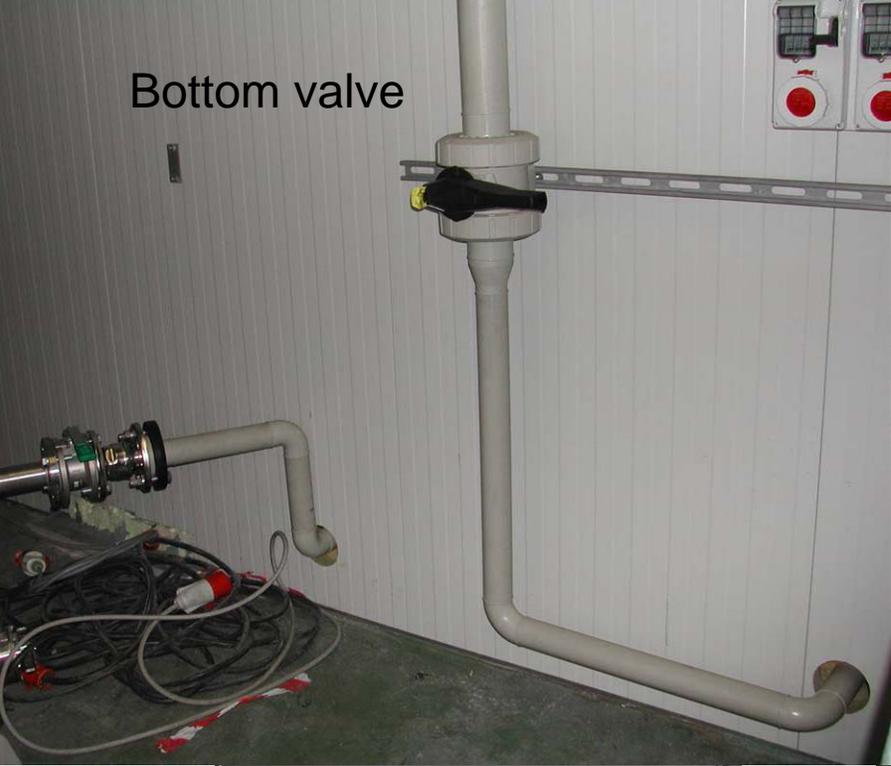
Level sensor simplified (no more buffer volume)

Critical parameters: Water level, Pressure

PLC read-out by slow control



Bottom valve



Water plant instrumentation



Electrical cabinet



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11-13 M

Top return valve



Conclusions

- WT static test performed OK. Certification available
- Water fast drain built
- Water drain authorization: expected in few days as announced by Teramo Provincia authorities
- Water plant built, Ultra-Q filter purchased
- Oxide problems showed up after draining water from WT for the first filling
- Test of Jackodur in demi-water performed (report available by (Balata, Ioannucci, Nisi): No problem for water quality, but as expected, VM2000 foil detach from Jackodur.
- Pickling and passivation procedures defined, agreed with companies and approved by LNGS SPP. Work started yesterday. Completed by end next week (21st march). The work cost will be shared among INFN/Di Zio and MP-Hd