SABRE South meeting

Veto Vessel Design status

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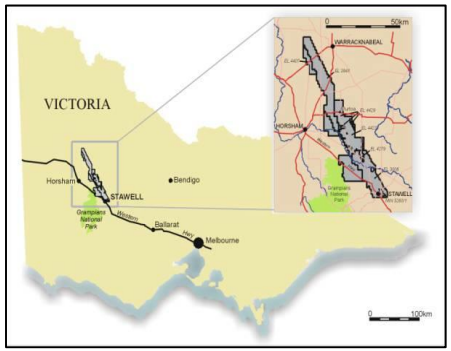
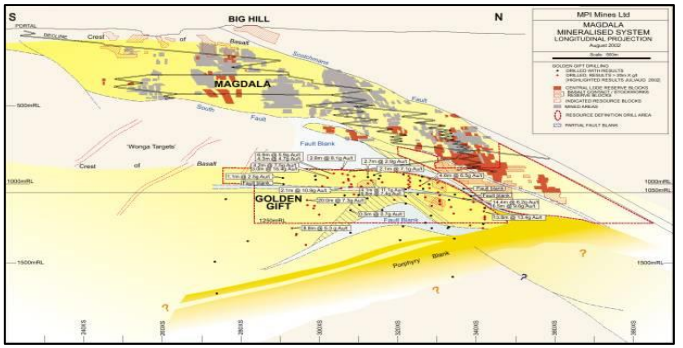
SABRE Full-scale: Introduction

- Design of **full-scale experiment Veto Vessel** in collaboration with LNGS and INFN-Rome (Donato Orlandi, Chiara Vignoli, Claudia Tomei, Valerio Pettinacci, Michela Paris);
- Collaboration tasks: Melbourne commitment for **outer structure design** (veto vessel, shielding); Rome-LNGS for **inner detector** (enclosure, CIS);
- First full scale experiment will be housed in the **Stawell Gold mine,** Victoria, Australia;
- Melbourne is **finalising the design** of the Veto Vessel;
- Inner detector design will follow the p.o.p. one – LNGS and Rome design;





SABRE Full-scale: Status

- Design manufacuring: **negotiation ongoing** with 3 main steel manufacturers from Victoria **(Furphy Engineering, Tasweld Engineering, Kempe Au);**
- Manufacturing **requirements:**

1) **No radioactivity** introduced during manufacturing: Ultra-clean process; dedicate site for stainless steel; special welding tips; specific coating/blasting procedures;
2) **Mechanical precision**: Mainly for the top flange (ensure ultra-high vacuum conditions).

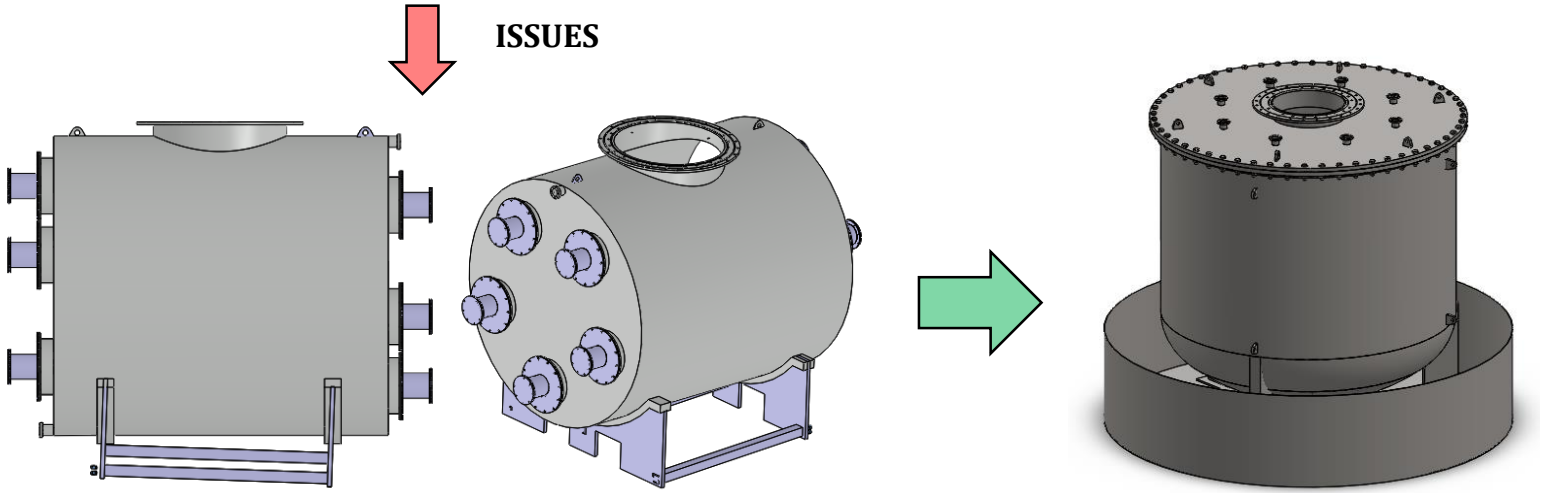
- Steel procurement is being discussed with the European company **NIRONIT** – it previously supplied low-radioactive steeel for GERDA, Xenon; final quote for steel will be requested *early next week;*
- Steel radioactivity measurements will be performed at LNGS – **agreement with Mathias Lubenstein** for number of samples and testing procedures;
- Once the steel quote is agreed with NIRONIT, we will proceed with the samples **shipment** to LNGS;

SABRE South Design approach

- Main idea: optimize the design of the final experiment in order to overcome **technical issues highlighted in the p.o.p.:**

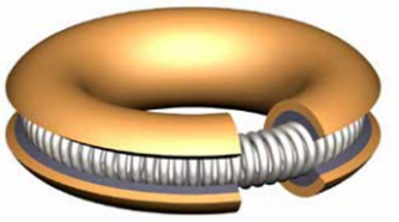
i) Flat ends; ii) horizontal position; iii) One nozzle for each PMT (10 in total); iv) P.M.T. not uniformely distributed onto vessel surface; v) Limited number of crystals can be inserted.

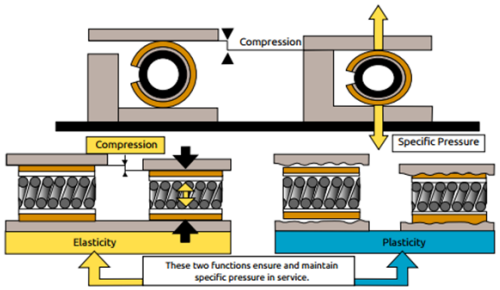
- «Our» veto vessel would consist of a «rotated» cylindrical steel tank, laying vertically onto a 3-columns support system.

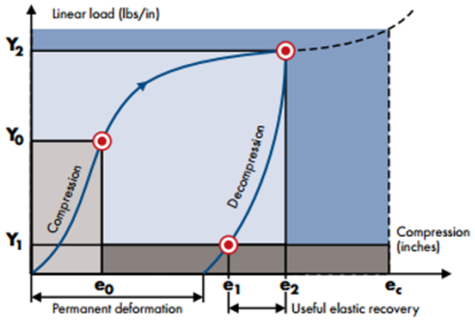


SABRE South Design summary

- Purpose: axial-symmetric system (inner detector to outer shielding);
- Main dimensions: roughly twice as the the p.o.p. ones (height, diameter);
- Liquid scintillator**:** **LAB** (Linear Alkylbenzene) rather than PC (Pseudocumene) – safety requirements from Stawell Mine;
- PMTs will be hosted *inside* the vessel detector rathern than on the outer shell. Solution adopted in other experiments (es. Borexino, DarkSide) – **R&D** will be performed;
- Use of «self-energizing» *Helicoflex* gasket – procurement ongoing **(Garlock GMBH, Technetics Group).**

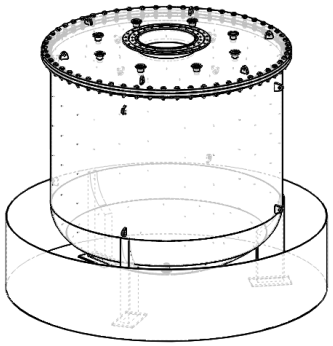


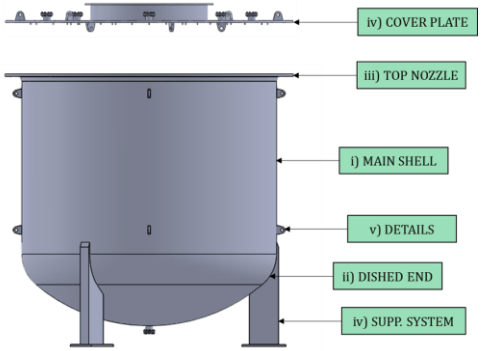


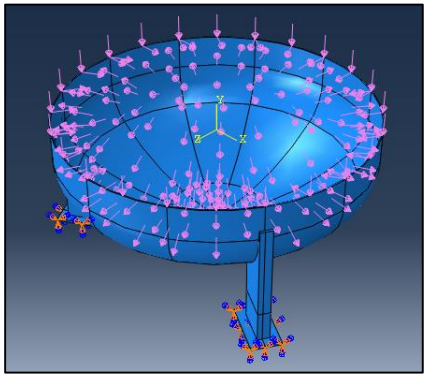


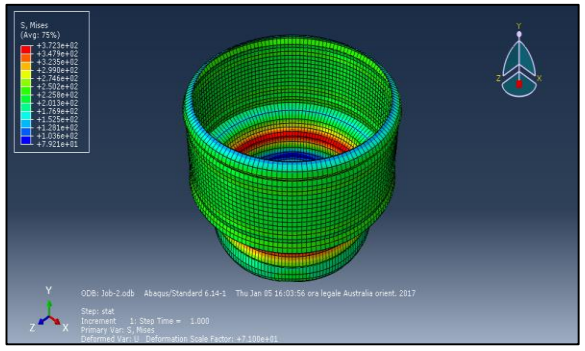
SABRE vessel analysis and design

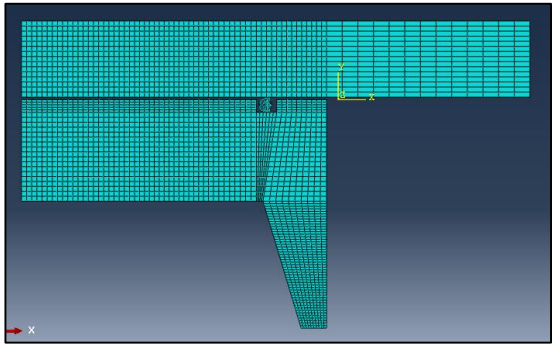
- The veto vessel is designed according to AS 1210 – Australian Standard on *Design and Construction of Pressure Vessels.*
- FEA simulations have been performed on vessel parts to ensure mechanical resistance.

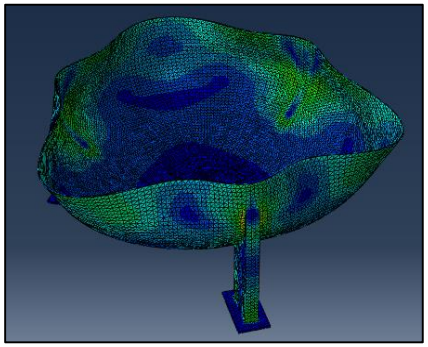










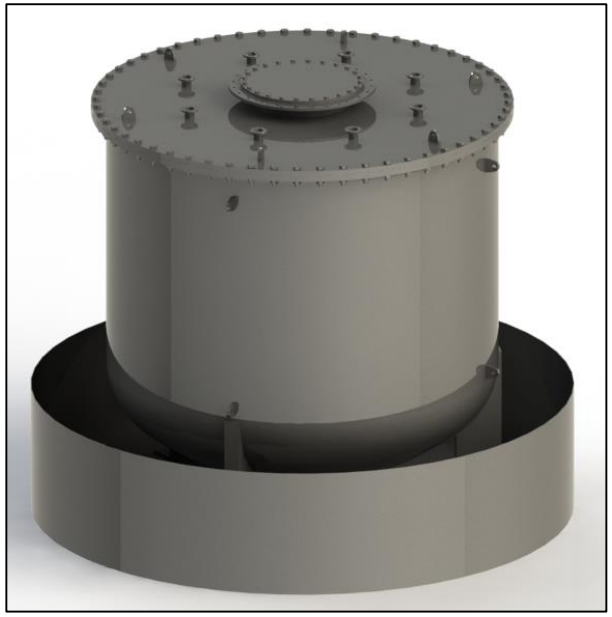


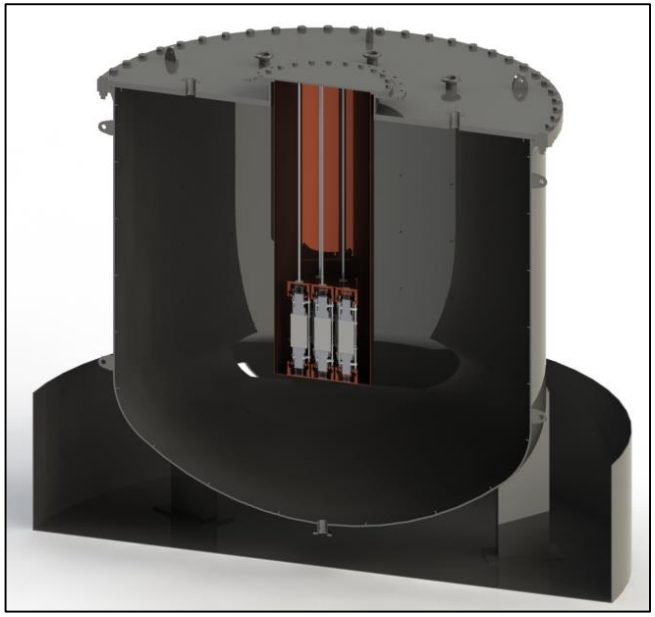
Upcoming tasks

- FEA dynamic analyses on the full-scale vessel are being finalised;

Future tasks:

- Shielding structure design;
- PMT sealing R&D.





THANKS