

SHIP Project - Filling the SBT

University of Naples Federico II

Working group - Hydraulic

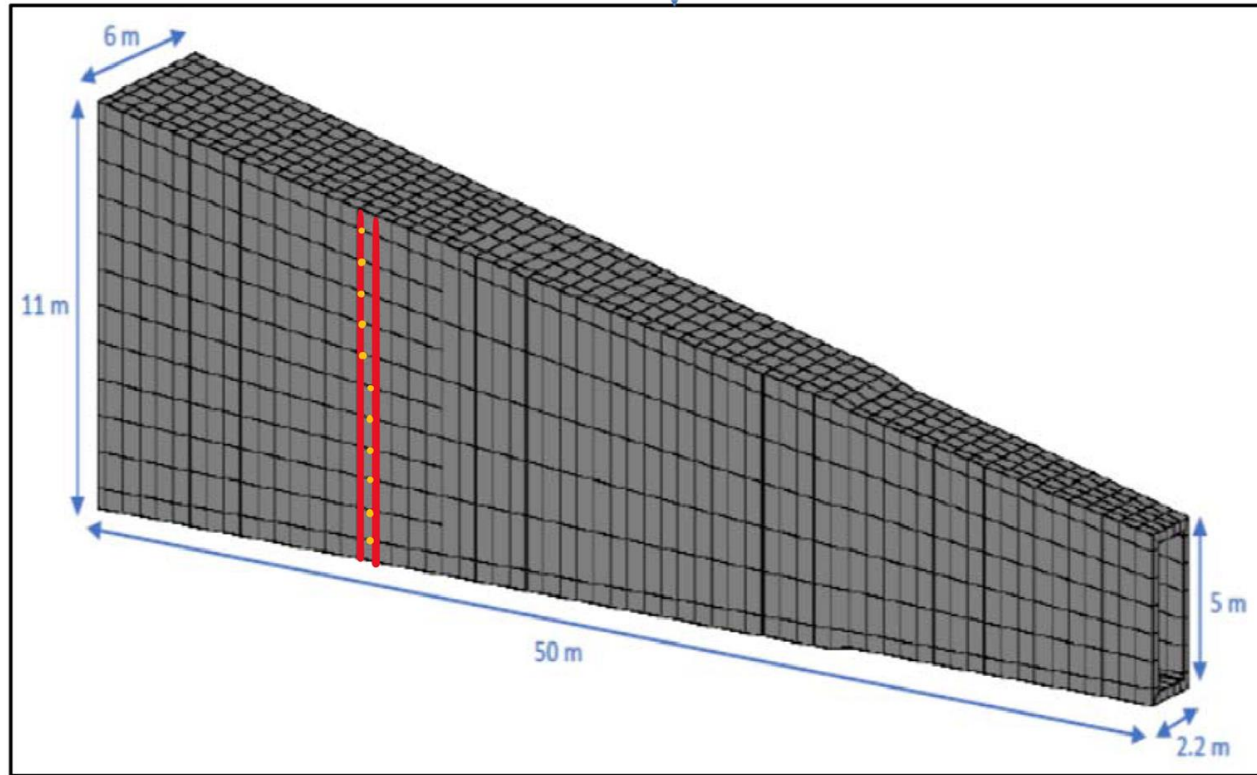
Prof. Armando Carravetta
Prof. Giuseppe Del Giudice
Prof. Francesco De Paola
Prof. Cristiana Di Cristo
Prof. Oreste Fecarotta

- Filling strategy
- Prototypes for different tests
- Timetable



SHIP Project - Filling the SBT

Objective: the SBT cells have to be completely filled by Liquid Scintillator without trapping gas bubbles.



Proposed strategy
Discussion
Check of structural aspects



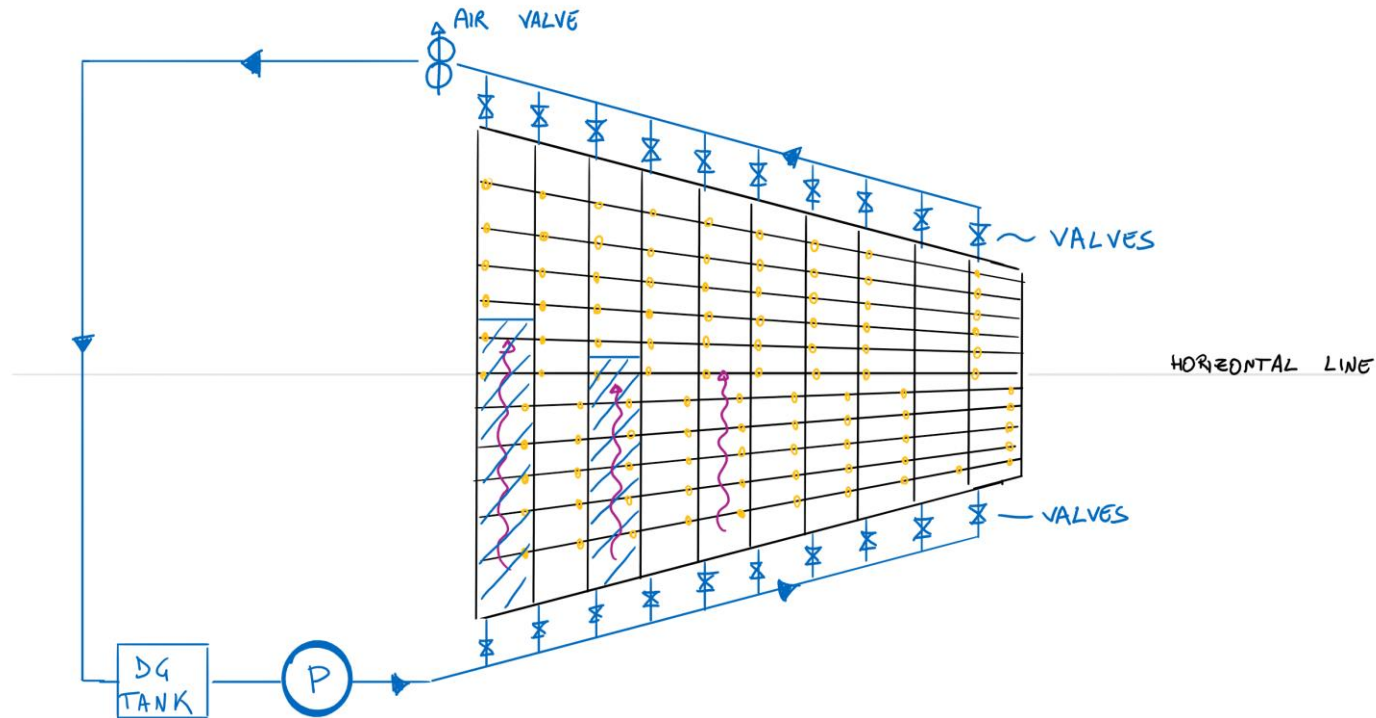
Final design
Prototypes and tests
Filling strategy



Proposed filling strategy

Filling strategy for each SBT face (bottom, top, side1 and side 2).

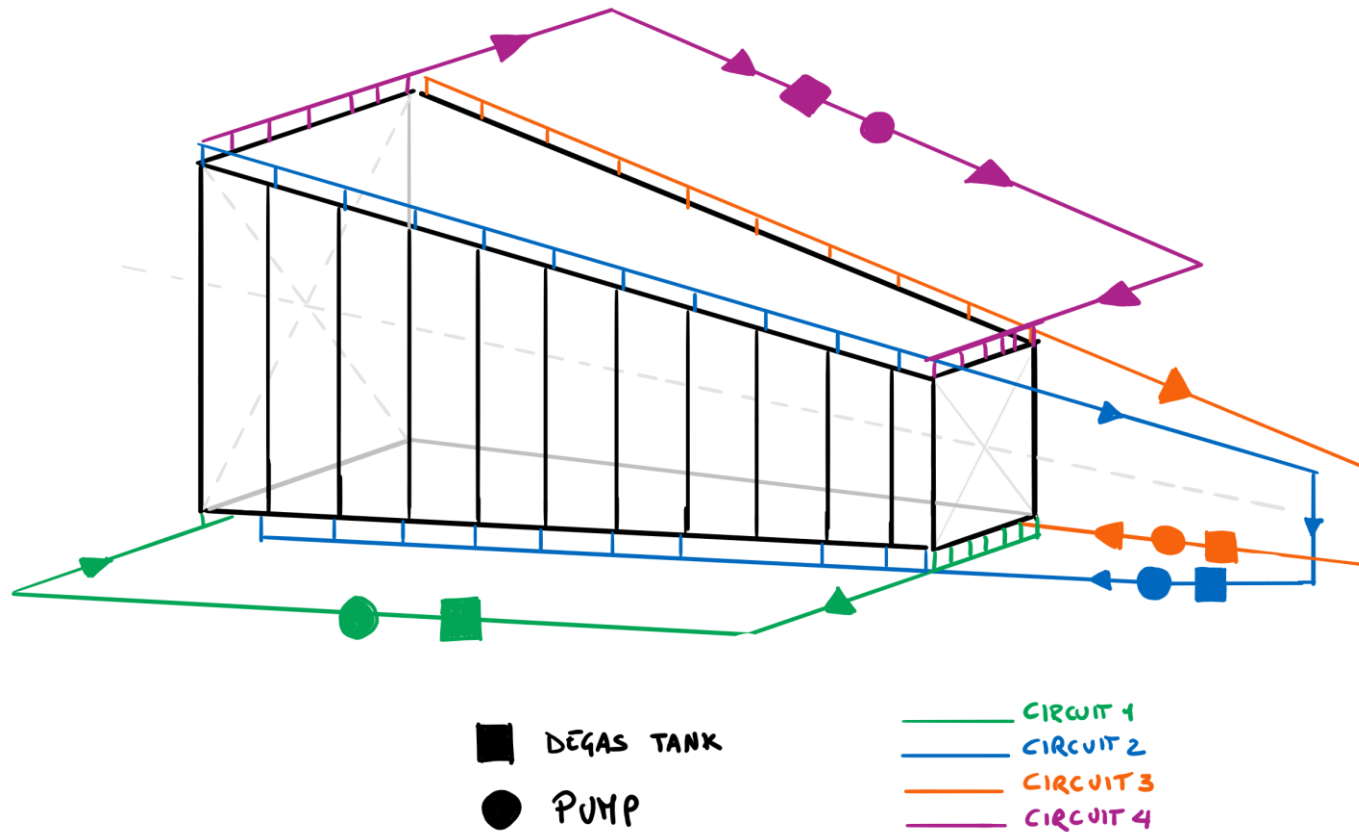
The best strategy to propose consists a close circuit connected to one pumping system. All rings are vertically interconnected through holes. The vertical columns are separately filled.



LS is introduced into the rings from the bottom using the pumping systems and following the counterslope direction. The liquid slowly moves into the circuits and air is expelled through air valves. The pumping continues until the air is completely eliminated.

Proposed filling strategy

4 circuits connected to one (or more) pumping system, one for each SBT faces (floor, ceiling, side1 and side 2).

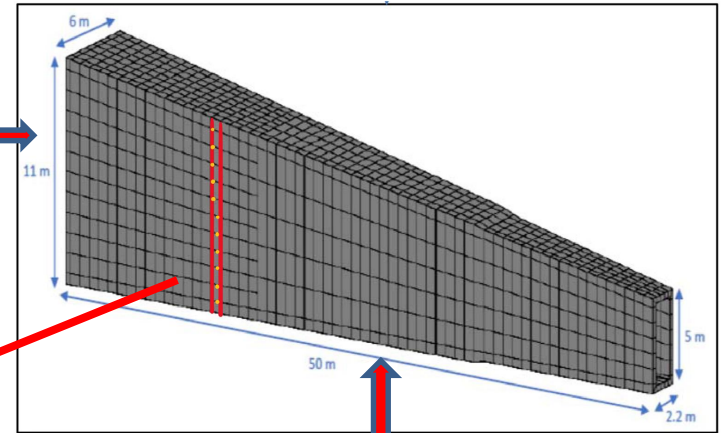


The pumping continues until the air is completely eliminated.

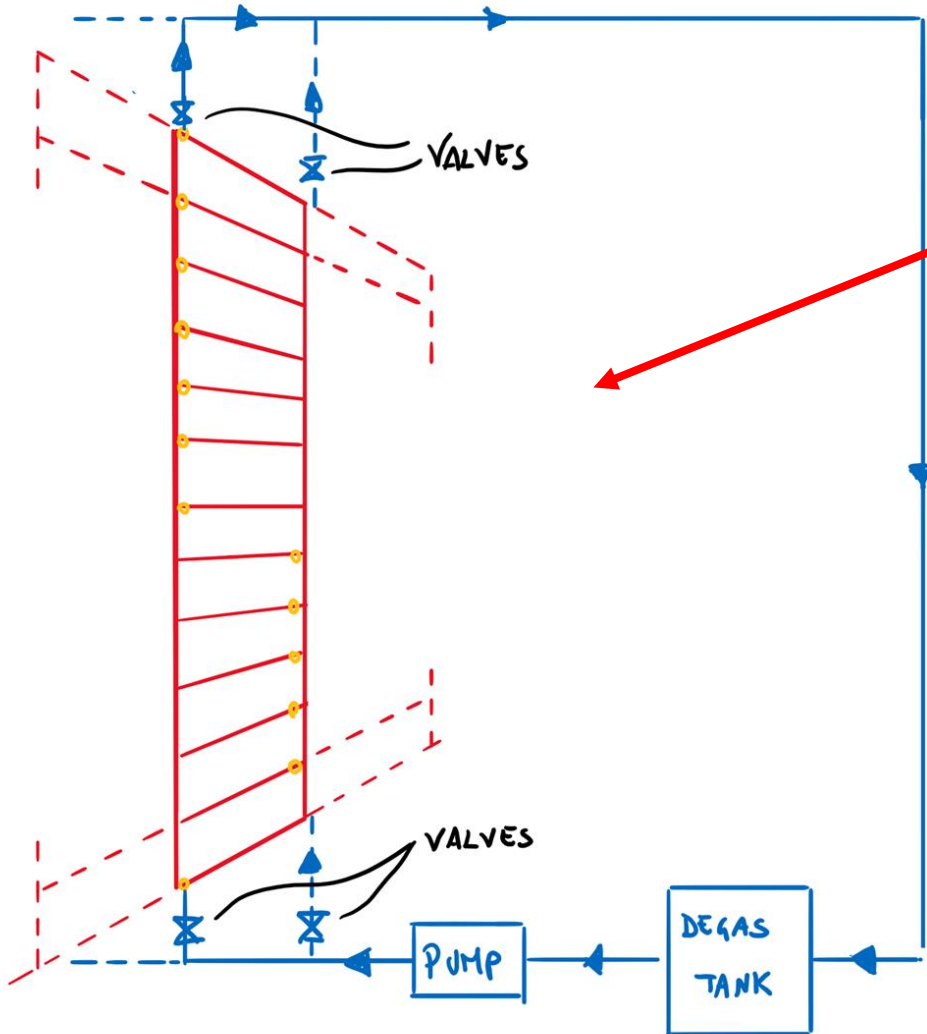


Proposed filling strategy

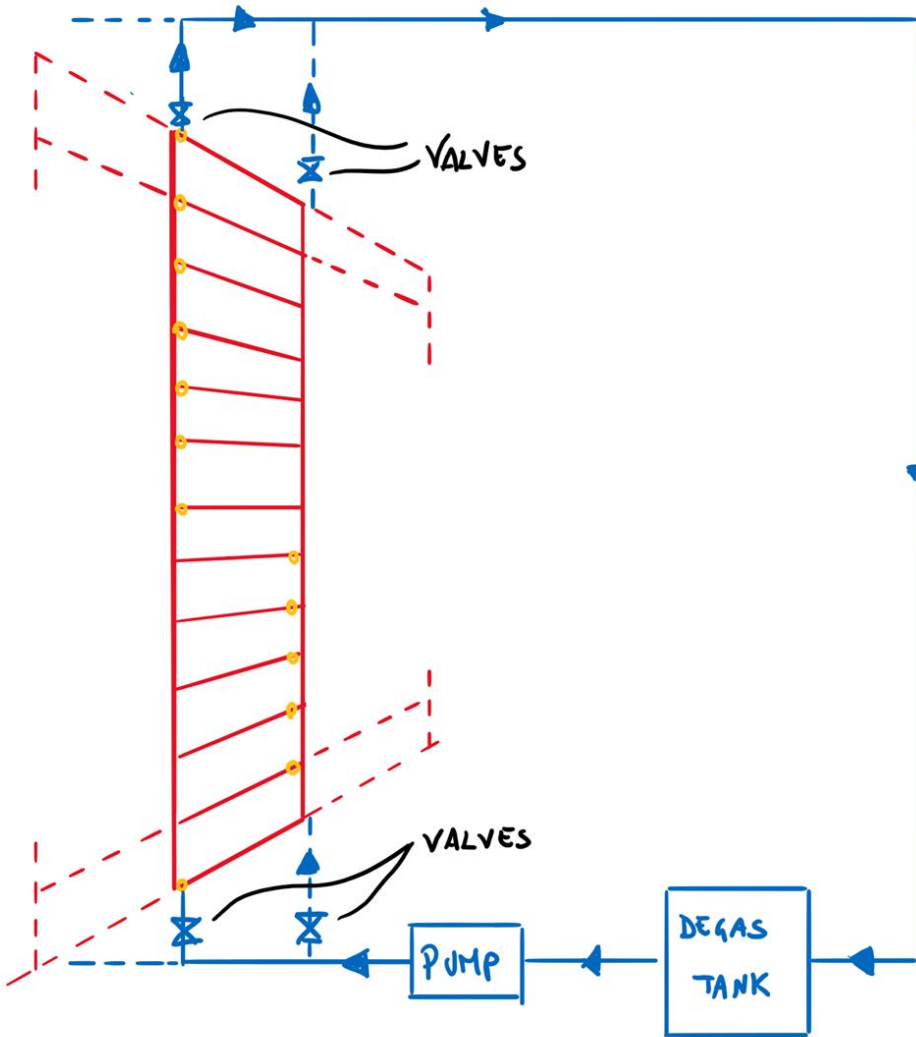
Side faces: fill separately
the vertical columns



Bottom and top faces: fill
separately the horizontal rows



Proposed filling strategy



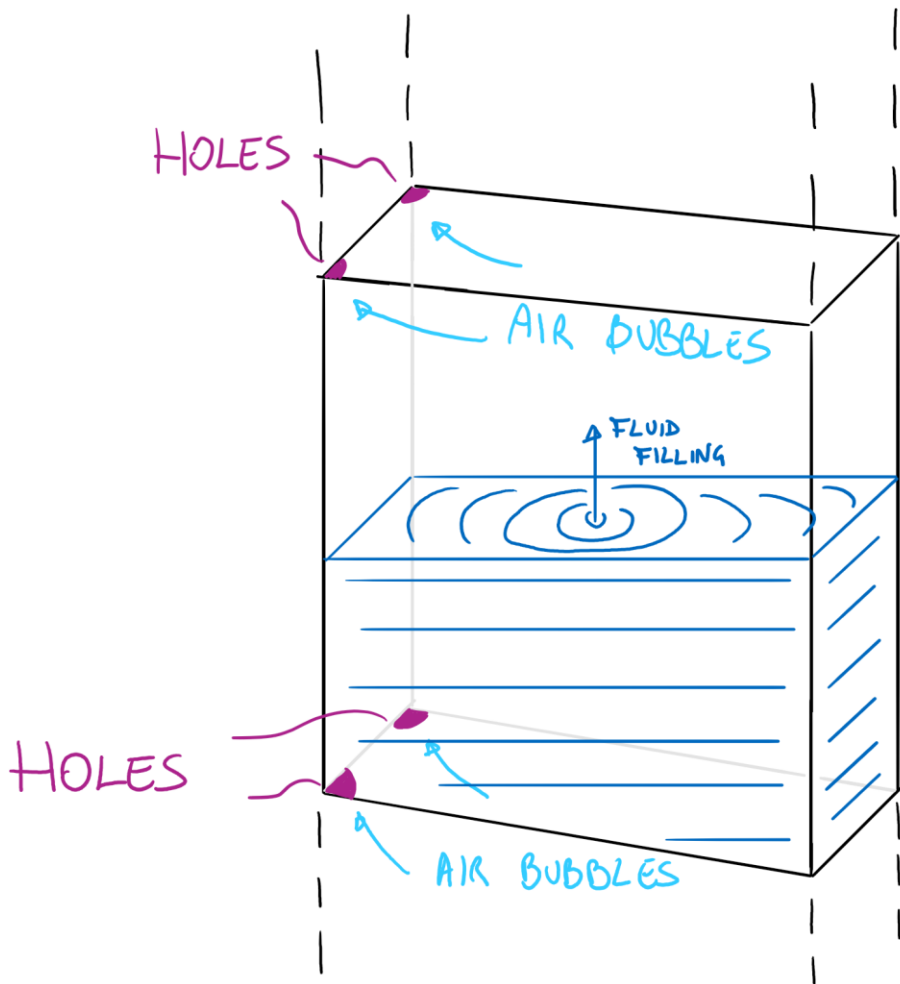
Counterslope direction.
The holes has to be placed considering the orientation of the rings.

The rings on the bottom and on the top are equipped with valves.

Air bubbles migrate to the top and are eliminated through the air valves



Proposed filling strategy



Filling time is crucial!!!

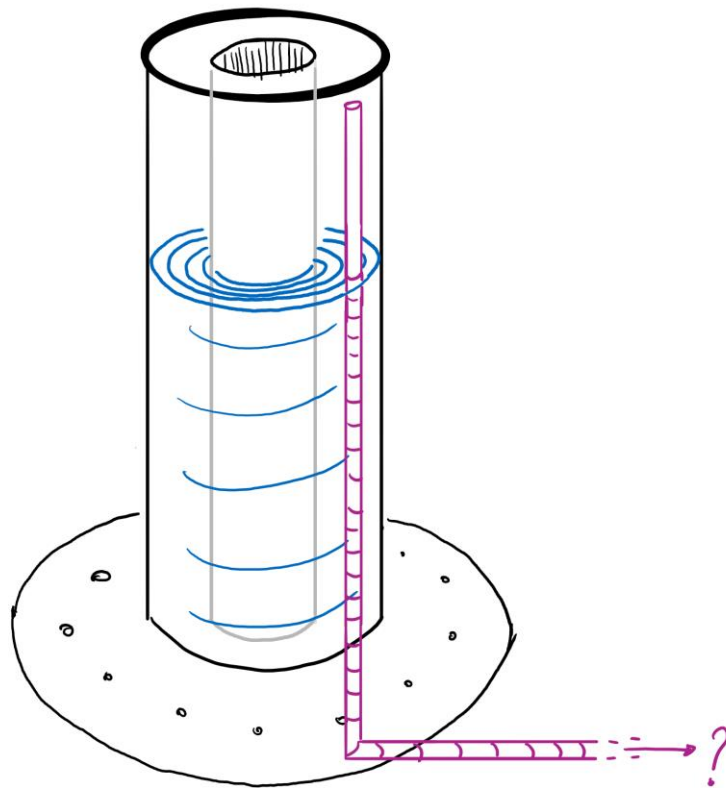
The filling has to be realized very slowly in order to have laminar regime.

The characteristics of the LS are important.

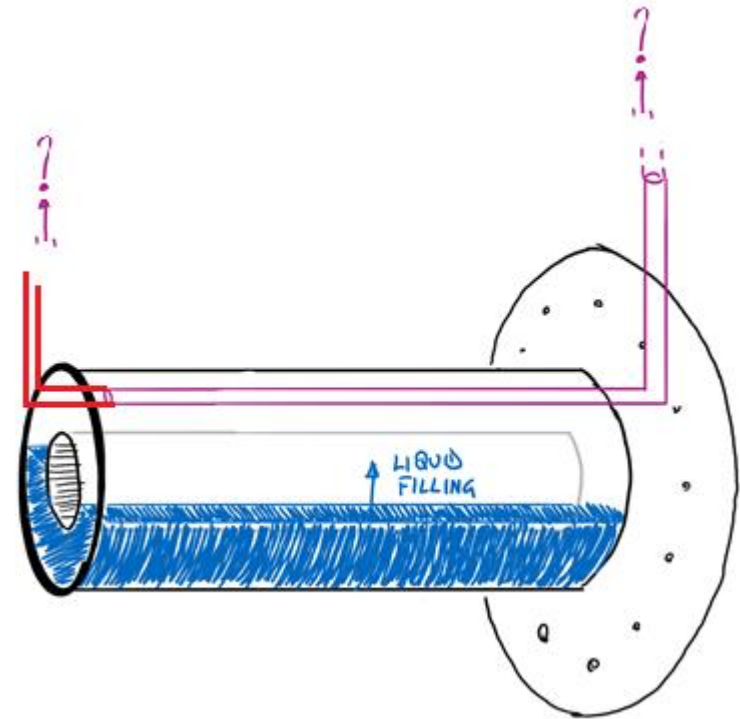


Cylindrical WOM tubes filling

To evacuate the air from the cylindrical cells very small pipes are introduced into the wall thickness.



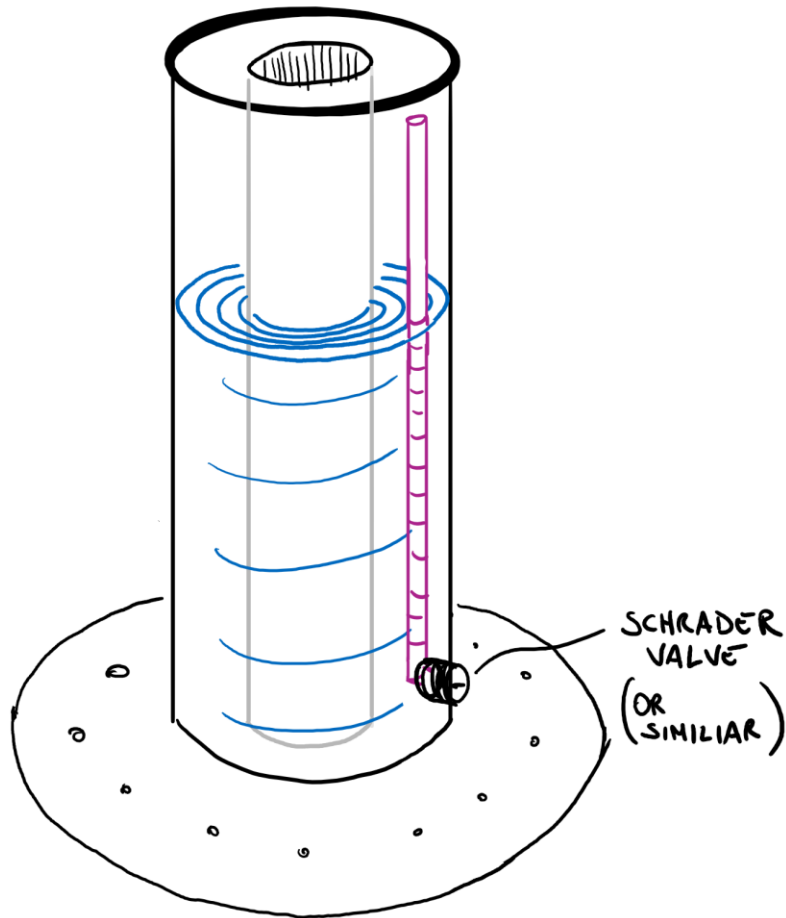
vertical



horizontal



Cylindrical WOM tubes filling



The air has to be extracted during the filling.



Prototypes and timetable

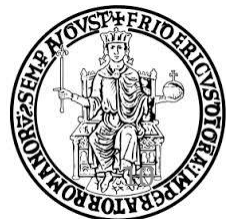
Ring prototypes : two transparent prototypes of 3 rings for verifying the filling strategy (direction and time) with the LS

- Visual analysis of air bubbles
- Pressure measurements
- Filling time tests

Small-scale prototype of the complete SBT with all circuits and pumping system.

- Full concept of the filling system
 - Final design
 - Prototypes and tests
 - Filling strategy

Timetable



Cylindrical WOM tubes filling

