HYDROSTATIC AND IMPLOSION TESTS

UAM-ARATZ "SPANISH" STAINLESS STEEL COVER TESTING RESULTS

David Bravo-Berguño (UAM)

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Manufactured by: Talleres Aratz S.A. in Vitoria (Álava, Basque Country, Spain) with acrylic dome from Kuraray (Japan)

Current design (30.7 kg) is 2nd iteration (see next slide) featuring improvements:
- Single-piece, truncated-conical, welded “barrel”
- Strengthened welded bottom
- Better force distribution through wider connection washers

Covers still developmental structural test articles with non-definitive components:
- Handmade bottom with large tolerances.
- Room for optimization in hole distribution
- Beefed-up top ring flange

Production cost ~€175/cover (+ one-time €150k overhead for molds and tooling)
2018 HYDROSTATIC TESTS RESULTS

• Tests performed in Aratz facilities in Vitoria 12-21 Feb, in a dedicated pressure chamber derived from water reservoir high-pressure turbine injectors that the company is producing

• Tested complete pieces of v.2 covers with 15mm-thick acrylic

• Water-tight bagged, protected by foam and sealed

• Successful test at 7 bar, minor deformations at 8 bar in an article.
IMPLOSION TESTS

- Tested together with Japanese SUS and recovery designs in Kami-Sunagawa’s (Hokkaido) ex-Japan Microgravity Center (JAMIC) facility (700m-deep pit flooded with ~12°C groundwater).

- Assembled in-situ and paired with newly-made Kuraray 20mm acrylic flanged dome.

- Cover was instrumented with 6 pressure gauges, tested at 60 m depth with 4 bare PMTs around it.

- All PMTs survived a nominal shockwave, **No deformation or damages** to cover or acrylic dome.
CONCLUSIONS AND FUTURE

• Positive progression toward a working low-cost design for HK PD covers:
  - v1.0 had problems at low P in hydrostatic test
  - v2.0 damaged at medium P in hydrostatic test because of manufacturing
  - v2.1 withstood high P with low damage in hydrostatic tests
  - v2.2 withstood high P with no damage in hydrostatic tests & passed an implosion test at 60m

• Results from pressure gauges show good shockwave attenuation

• Road open for further v2.x testing and v.3 development