RICH Air-Cooling Distribution Manifold

Date: September 27, 2017
Time: 10:00AM – 11:00AM

Attendees: Dario Orecchini, Marc McMullen, Marco Mirazita, Matt Marchlik, Sandro Tomassini, Vincenzo Lucherini, Tyler Lemon

1. 3D-printed components are not rated for any pressure system.
    - 1.1. Because of uncertainties in the fabrication process for 3D-printed parts, parts are considered "non-listed components" under ASME standard.
    - 1.2. Cannot submit data and calculations on material and 3D-printed part to any authority (as with RICH's lifts) because of uncertainties in 3D-printing process and quality.
    - 1.3. To have parts ASME certified:
        - 1.3.1. Send raw material and fabricated part for analysis to determine strength and pressure capabilities of material and part.
        - 1.3.2. Examine 3D-printed process to ensure parts are printed in a way where an entire component is uniform (for example: no gaps in layers, no areas with less material).
        - 1.3.3. Test final 3D-printed part to determine pressure rating.
        - 1.3.4. Certification process would be expensive and very time consuming.

2. Two solutions that will allow RICH cooling distribution to be Design Authority (DA) approved:
    - 2.1. Solution 1: ensure pressure in 3D-printed manifold does not exceed 15 psi.
        - 2.1.1. Would add relief valve before 3D-printed manifold to ensure pressure does not exceeds 15 psi.
        - 2.1.2. Pros of using 3D-printed part and < 15 psi:
            - 2.1.2.1. Can use all parts already fabricated.
            - 2.1.2.2. Manifold does not need DA approval because of low operating pressure.
        - 2.1.3. Cons of using 3D-printed part and < 15psi:
            - 2.1.3.1. Cannot guarantee that 15 psi will allow for adequate cooling of RICH electronics based on previous tests of mock-up cooling system by INFN.
    - 2.2. Solution 2: replace 3D-printed manifold with a manifold made of stainless steel or aluminum.
        - 2.2.1. No pressure limits for manifold as stainless steel and aluminum piping would be made to ASTM standard.
        - 2.2.2. Pros of using stainless steel/aluminum manifold:
            - 2.2.2.1. No pressure limit for manifold; can operate using cooling system as designed.
            - 2.2.2.2. Relatively easy DA approval as material used would already meet required standard.
        - 2.2.3. Cons of using stainless steel/aluminum manifold:
            - 2.2.3.1. Would need to reconfigure cable tray bracket to use round pipe.
            - 2.2.3.2. Would need to find way to attach round piping to electronic panel in way that prevents pipe from rotating and causing airflow to be misdirected.

3. Decided that cooling system will be modified to use stainless steel/aluminum manifold (Solution 2 above).
    - 3.1. Dario Orecchini will submit new drawing of stainless steel/aluminum manifold to Matt Marchlik (DA) for approval.

3.2. Matt Marchlik will provide options for ½ -inch outer diameter piping that meets required standards.
    3.2.1. Will try to find aluminum piping as material in non-magnetic, but stainless steel piping is okay if appropriate aluminum piping cannot be found.
3.3. DSG will procure DA-recommended piping.
3.4. Dario Orecchini and Sandro Tomassini will redesign cable tray for round piping and find solution to fasten round piping to electronic panel.
3.5. Could epoxy square brackets onto round piping that will ensure air stays directed at appropriate location in electronic panel and piping does not rotate during installation.