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C2Po3D-08: Concept of structure and testing method of a levitating support for single-channel cryogenic transfer lines

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Losses occurring during the transfer of cryogenic media using single-channel transfer lines depend on their length, hydraulic and thermodynamic quality. Single-channel cryogenic transfer lines often have a modular structure and are characterized by the use of many repeatable elements. Each module of the cryogenic transfer line consists of several elements typical of most structures. Bayonet connector, compensation bellows, sliding supports whose task is to ensure stable operation of the bellows and the appropriate distance between the process pipe and the vacuum jacket. Among the above-mentioned elements, the thermal loses of the entire system is influenced by bayonet connectors and sliding supports - these are elements that conduct heat from the environment to the process pipe.
So far, limiting the heat flow by conduction through sliding supports was achieved by minimizing the thickness of the support and reducing the contact area with the vacuum jacket and the process pipe. These treatments lead to a weakening of the support strength and a reduction in the reliability of the structure. The best solution to maintain good strength properties and limit heat transport to the transfered cryogen to be the use of non-heat-conducting supports. Such requirements are met by levitating supports based on the Meisner effect. This paper presents the concept of the structure and operation of the sliding support, as well as the design of a test stand used to test the mechanical properties of levitating supports.

Author: Dr DUDA, Paweł (Wroclaw University of Science and Technology)

Presenter: Dr DUDA, Paweł (Wroclaw University of Science and Technology)

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