

Intervento realizzato da



Politecnico
di Torino



In consideration of the determination of the Regione Piemonte – Direzione Istruzione, formazione e lavoro No. 218 of 2022, May 3 which listed the higher institutions authorized to activate PhD positions in the apprenticeship format for the years 2022-2024 in the framework of a specific regional call for proposals (Apprendistato di Alta Formazione e Ricerca - Avviso Pubblico 2022-2024 per l'individuazione e la gestione dell'offerta formativa pubblica approvato con Determinazione 114 del 3/3/2022 e s.m.i.)

MECHANICAL ENGINEERING

Advance methodology for designing cryogenic pumps

Company	Vanzetti Engineering S.P.A. [Piva/CF:02104460049]
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Context of the research activity	<p>The Ph.D. student will investigate many aspects of the design of cryogenic pumps in order to provide the company that provides the apprenticeship with methodologies capable of innovating the product. During the activates materials, design process, boundary conditions and actual working conditions will be analysed.</p> <p>The Company Vanzetti Engineering has planned for the winner of this position a collaboration within a contract of high apprenticeship according to the Italian Legislative Decree 81/2015, art. 45.</p>
Objectives	<p>The aim of this study is the fluid-dynamic/structural design, development and testing of cryogenic reciprocating pump having high performance in terms of flow-rate and discharge pressure, balancing at the same time a long life of the main worn items.</p> <p>The first point is to identify a new design solution for a high load and speed crank-drive.</p> <p>Then, about the cold-end group (i.e., piston, sleeve and suction/discharge valves), it requires to analyse the LH2 liquid hydrogen application. So that, it is also important to investigate:</p> <ul style="list-style-type: none"> the heat transfer and cooling mechanism of cryogenic volumetric/piston pump and its cavitation behaviour; the best metal/polymer sealing solutions, having high performance, wear and

Objectives	<p>friction control.</p> <p>On the other hand, the purpose of this study is to observe and understand the fluid dynamics of flow and its significance to the cooling performance of pump, considering various configurations of the suction/discharge valves. Computational Fluid Dynamics (CFD) simulations have to be conducted in order to define the flow characteristic across the pump valves and the temperature distribution inside the cold-end group.</p> <p>Finally, the designs will be validated through bench tests in LIN-liquid nitrogen cryogenic conditions, comparing the performances with changing the main parameters (i.e., materials, configuration of piston head with its valve, dimensions and clearances in cryogenic conditions, et cetera).</p>
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Skills and competencies for the development of the activity	<p>The candidate shall be less than 30 years old at the moment of the hiring from the company.</p> <p>The candidate needs competence in:</p> <ul style="list-style-type: none"> Machine Design Numerical Methods Experimental Techniques.
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