



POLITECNICO DI MILANO
PhD Programme in Mechanical Engineering
XXXIX cycle

Research Field: Aerodynamics of high-speed freight trains

Scholarships and Financial support	
Monthly net income of PhD scholarship (max 36 months)	€ 1.400 <i>(In case of a change of the welfare rates during the three-year period, the amount could be slightly modified)</i>
Context of the research activity	
Motivations and objectives of the research in this field	<p>Train operation faces many engineering problems, from train running dynamics and ride quality to aerodynamics and aeroacoustics. In particular, train aerodynamics and aeroacoustics still faces significant issues and research needs for both passenger and freight trains. Specifically, freight trains are faced with the challenge of significantly raising their speed, in order to achieve a better competitiveness with respect to other competing cargo transportation modes. While the long-term goal for the maximum speed of freight trains is in the range of 200 km/h, the speed of 160 km/h is envisaged for the near future and this PhD Programme aims to contribute to meet such objective.</p> <p>This PhD position aims at achieving an improved understanding of the aerodynamic effects, considering the specificities of freight trains, and to synthesize the knowledge gained in this research into recommendations for extending and improving existing standards for train aerodynamics, proposing freight train-specific criteria.</p>
Methods and techniques that will be developed and used to carry out the research	<p>The aerodynamics of high-speed freight trains features specific challenges: freight wagons are not designed to have an aerodynamically optimised shape and instead behave as bluff bodies. Hence, modelling their aerodynamic behaviour is highly challenging and involves significant unsteady effects. In a first stage of her/his work, the PhD candidate will build a database of wagon geometries, considering the most common freight coach configurations. This approach has been successfully applied to the automotive industry with the DrivAer model and the ECoGet project for the commercial vehicle sector.</p> <p>Then the PhD will define multiple CFD models having different levels of complexity. For this purpose, relatively fast steady-state Reynolds-Averaged Navier-Stokes (RANS) models will be used for a first investigation of flow features for different</p>

	Number of Assistant Professors: 1 Number of PhD students: 3
Names of the research director	<i>Prof. Stefano Bruni</i> <i>Prof. Daniele Rocchi</i>
Contacts	For questions regarding the research topic: Prof. Stefano Bruni (stefano.bruni@polimi.it) Associate Professor Paolo Schito (paolo.schito@polimi.it) For questions about scholarship/support phd-dmec@polimi.it
Additional support	
<p>Financial aid is available for all PhD candidates (purchase of study books and materials, funding for participation in courses, summer schools, workshops and conferences) for a total amount of € 5.707,13.</p> <p>Our candidates are strongly encouraged to spend a research period abroad, joining high-level research groups in the specific PhD research topic, selected in agreement with the Supervisor. An increase in the scholarship will be applied for periods up to 6 months (approx. 700 euro/month - net amount).</p> <p>Teaching assistantship: availability of funding in recognition of supporting teaching activities by the PhD candidate. There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.</p>	