



Roma Tre

DIPARTIMENTO DI
INGEGNERIA INDUSTRIALE,
ELETTRONICA E MECCANICA



Seminario

The Future of Mobile Hydraulics for Off-Road Mobile Machinery

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Abstract

Mobile hydraulics remains a core technology for off-road mobile machinery, providing unmatched power density and robustness for these demanding applications. However, the sector is undergoing a significant transformation driven by increasing requirements for energy efficiency, digitalization, productivity, and environmental sustainability. This presentation provides an overview of current working hydraulic topologies, ranging from conventional valve-controlled load-sensing systems to displacement-controlled, electro-hydraulic, and decentralized actuator architectures.

The future of mobile hydraulics is characterized by greater electrification, with electric drives enabling efficient hydraulic power generation, energy recovery, and seamless integration into hybrid and fully electric machines. At the same time, advances in sensing, connectivity, and control algorithms can make hydraulic systems more intelligent, enabling predictive operation, condition monitoring, adaptive control, and autonomous functions. Sustainability considerations are also accelerating the adoption of energy-efficient architectures, environmentally friendly fluids, and lifecycle-oriented system design.

About the Speaker

Tatiana Minav is Associate Professor in Hybrid Drives at Tampere University, Finland, within the IHA – Innovative Hydraulics and Automation research unit. She received her Doctor of Science in Technology degree from Lappeenranta University of Technology in 2011.

Her research focuses on the electrification of off-road mobile machinery, electro-hydrostatic systems and actuators, zonal hydraulics, and electric and hybrid powertrains. Her expertise includes sensorless motion control of hydraulic cylinders, system simulation, energy efficiency and energy recovery, as well as thermal hydraulics and condition monitoring.

She has participated in and led research projects funded by Business Finland and the Academy of Finland, addressing the electrification of mobile machinery and its working implements. Her work connects electrical and mechanical engineering to develop energy-efficient drive and actuation solutions for next-generation mobile machines.