Thesis Topic: Soft cylindrical track modules for pipe robots

What is this about?

The proposed robot locomotion mechanism is intended for operation in **sewer inspection robots**, where environmental conditions are significantly more demanding than in clean industrial pipelines. Sewer environments contain sludge, grease, debris, and biological waste that can accumulate on mechanical components, often causing conventional actuators and locomotion systems to clog, lose traction, or fail. In addition, sewer pipes present varying diameters, bends, and uneven surfaces that require adaptable and robust mobility solutions.

To address these challenges, this thesis explores a **soft cylindrical track module** designed to reduce fouling, improve surface conformity, and maintain reliable locomotion in contaminated environments. The work is conducted as part of the **PIPEON project** (www.pipeon.eu), which aims to develop advanced robotic technologies for autonomous inspection and maintenance of sewer infrastructure.

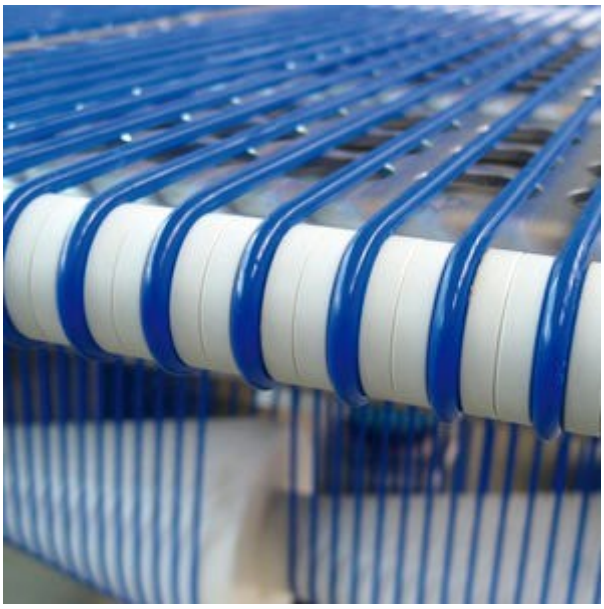

Figure 1. Example cylindrical belts used in industry

What will you learn?

- Robotics design and locomotion systems
- Mechanical design and CAD modeling
- Material selection for flexible structures
- Prototyping and rapid manufacturing (e.g., 3D printing, soft materials)
- Experimental testing and performance evaluation
- Engineering research methodology and documentation

Why is this important?

Pipeline infrastructure plays a critical role in modern society, transporting water, oil, gas, and waste across vast networks. Inspection and maintenance of these systems are challenging due to limited accessibility, hazardous environments, and operational risks for human workers.

Requirements:

- Fundamentals of mechanical engineering or robotics
- Basic knowledge of dynamics and mechanics
- Experience with CAD software (e.g., SolidWorks, Fusion 360, or similar)
- Programming basics (Python, C/C++, or MATLAB)
- Familiarity with prototyping tools and workshop practices
- Independent work and technical reporting

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