

Robots for Hazardous Environments: Natural Gas Pipeline and Nuclear Applications

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Natural Gas Pipeline Abstract -- The Acronym Name (LDC) is a robotic tool to inspect and internally seal bell-and-spigot type joints in cast iron natural gas mains. Specifically, the seal is achieved by injecting a liquid anaerobic sealant into the jute packing of the joint. Upon curing, this sealant is a more effective and durable seal than the original lead seal. Hence, this joint repair technique has become the favourite repair method in recent years. The LDC robot repairs the joint while gas is flowing in the pipe; therefore, service is not disrupted during maintenance and repair.

Index Terms—Natural gas pipelines, cast iron mains, internal pipe inspection, robotic, remote control, repair of live mains, no-blow operation.

Nuclear Application Abstract -- The Acronym Name (AARM) is a robot tool for remote visual inspection of the internal control rods, hardness testing of the shielding wall, and debris retrieval operations inside a nuclear reactor. Due to the high levels of radiation, no other method is available for this type of inspecting the reactor core after it becomes operational. During a reactor retrofit operation, the robot is inserted through a lattice sleeve tube into the core once the fuel and pressure tubes have been removed. The consequences to damaging the core are extreme; hence, the manipulator is equipped with collision detection sensors and a physical limit on the contact forces that can be applied.

Index Terms—nuclear reactor, internal inspection, robot arm, remote control, collision avoidance, radiation shielding.