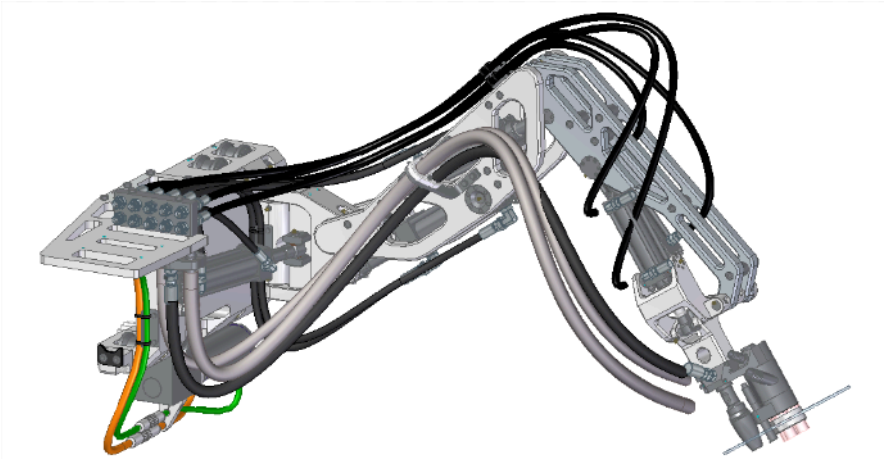
Structural integrity analysis of a robotic arm for safer decontamination in nuclear power plants



CAD-model of the robotic arm

Nuclear power plants demand meticulous maintenance to ensure safe operations, particularly in decontaminating radioactive particles from various components. Fagerström Industrikonsult AB has addressed this need with their innovative robotic arm, equipped with a wet blasting gun, which revolutionizes the decontamination process by eliminating the need for direct human involvement. However, to fully meet industry demands and allow for the addition of a gripper tool for handling components, the structural integrity of the robotic arm must first be verified, which is the objective of the report.

The results were promising yet highlighted specific areas of concern. The large aluminum sections, which make up most of the arm, were found to be sufficiently strong to handle lifts of components and collisions. However, certain steel parts used to connect these aluminum sections were at risk of undergoing plastic deformation, especially during collision scenarios.

The study found that by reinforcing the steel parts, Fagerström can equip the arm with a gripper tool for handling of components. This advancement would significantly enhance safety in nuclear power plants, allowing both decontamination and component handling to be performed entirely without human involvement.

The study utilized Ansys software to simulate normal operation and collision scenarios. The arm was then analyzed using finite element methods to determine the stresses involved. To evaluate the results the Eurocode standards were utilized.

This work was done as a master's thesis at Lunds University in collaboration with Fagerström Industrikonsult AB.

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