Newsletter 4

TMCOMAS, AIMEN, and Ziknes take on R3-Mydas, to achieve full automation and optimization of crankshaft repair processes in the Oil & Gas industry.

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Advancements in Automated Crankshaft Repair in the Oil & Gas Sector

As part of our ongoing efforts to transform crankshaft repair in the Oil & Gas sector, we have advanced to the next phase of our project by conducting targeted tests on crankshafts sourced directly from the industry. These tests are instrumental in fine-tuning our techniques and ensuring their effectiveness in real-world applications.

Integrating Sensors into Robotic Systems

To advance the automation of the repair process, both sensors were integrated into the robotic system. The calibration operations were completed by utilizing CAD matching algorithms for camera-robot calibration to determine the camera's position relative to the wrist of the robot, then we obtain the camera TCP (Tool Center Point).

We are actively working on enhancing the generation of scanning trajectories. The goal is to achieve results that are as close to reality as possible. While some scripts have been developed, they are not yet fully integrated. During testing, we used RobotDK to simulate and refine the process by designing our work cell within the software. Once this algorithm is refined, it will be done an integration of the snapshot camera into the robotic system for further automation trials.

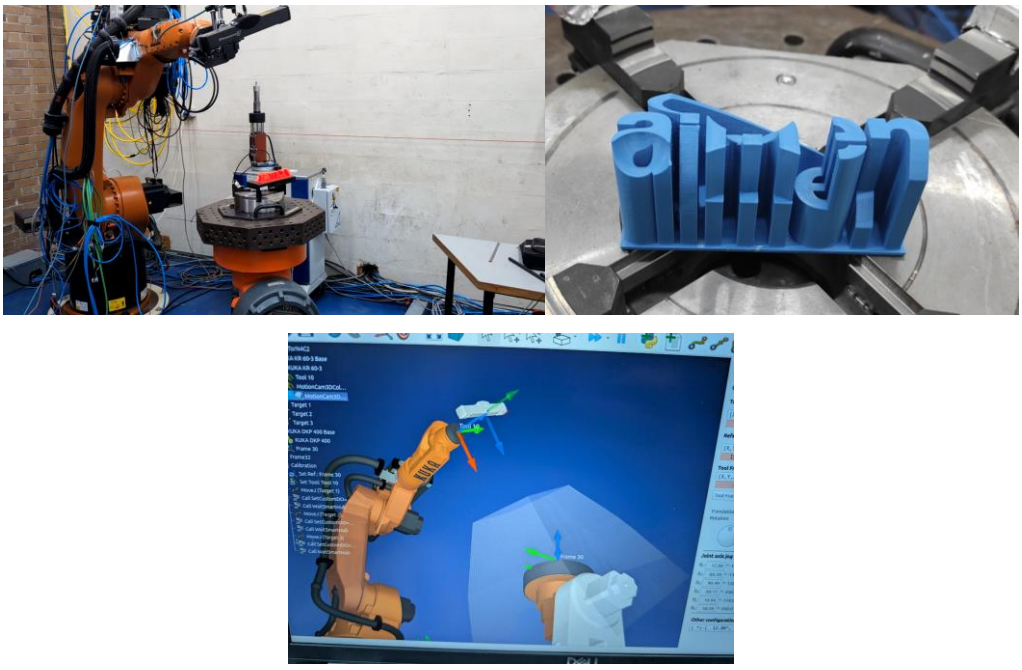

Figure 1. Calibration process in real and virtual cell respectively.

Robot simulation & Path-Planning

The simulation will play a key role in generating collision-free robot trajectories for both the cladding and scanning processes. By optimizing these trajectories, we can significantly improve the efficiency and precision of the automated repair system.

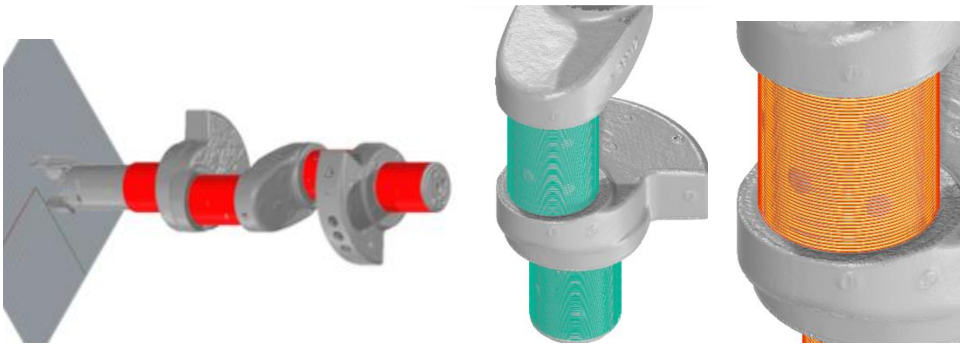

Figure 2. Surface identification and path-planning

In recent months, we have concentrated on two key aspects of our work. First, we have work on identified the volume that needs to be recharged, ensuring precise material application during the process. Second, we advanced the simulation of the robot's movements to anticipate and avoid potential collisions. To achieve this ZIKNES have model cell at AIMEN facilities with high precision, incorporating all critical components and parameters to create a simulation as close to reality as possible. This simulation also enabled us to perform the robot's programming offline, streamlining operations and reducing downtime.

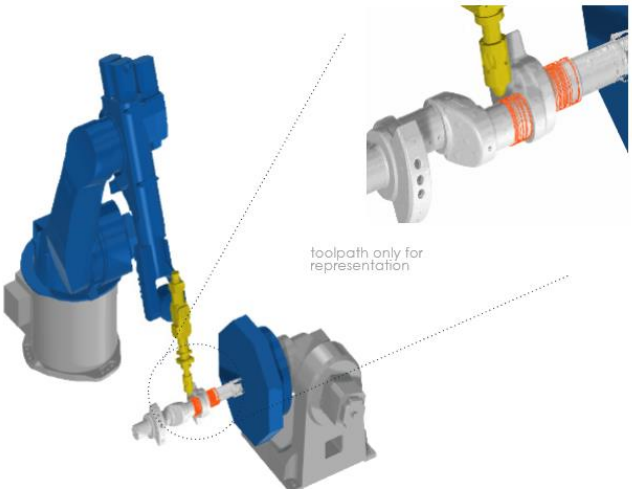

Figure 3. Robot simulation.

Results and Findings

We have successfully automated the scanning process using the snapshot camera, marking a significant improvement in efficiency and precision. However, the current process requires further optimization to reduce its time consumption and enhance the quality of the generated point cloud. To address these challenges, we are working on implementing a trajectory generation script for the scanning process, which will improve both speed and resolution.

Additionally, we have developed a virtual cell that allows us to perform necessary tests and validations before transitioning to the real cell, minimizing risks and ensuring process reliability. Furthermore, we are actively developing an algorithm to efficiently coat the worn crankshaft, a critical component of our current workflow. These efforts collectively contribute to a more streamlined and robust operational process.

Future Steps

Our next steps will focus on further optimizing the point cloud generation process to improve its efficiency and quality. Additionally, we will continue conducting robot simulation tests to refine the digitalization of the process and advance towards full automation. These efforts aim to ensure a seamless and efficient workflow, enhancing both precision and productivity.