Contamination modeling and studying its impact during the assembly of a hydraulic motor

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**Liebherr Case Study:**
Find the most important contamination sources during the assembly of a hydraulic motor in order to link the oil cleanliness and the components pollution during the assembly and if required, prepare the correct action to decrease the oil contamination.

**Project Goals:**
- Model a complex system using the Model-Based Engineering to have a better understanding of the contamination in an open-environment.
- Identification of the Key Performance Indicators responsible of the hydraulic products contamination

**Methodology & Modeling :**
- Modeling the system by studying the hydraulic assembly sector at Liebherr Machines Bulle (LMB) and a hydraulic motor using AGILE methodology.
- Through cleanliness tests, the impact of different variable is measured and allow the identification of the KPI.

**Model-Based Engineering (MBE):**
- An Iterative approach using models as an integral part of the technical baseline
- The models support system activities during the whole system life-cycle

**Results :**

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Washing station water cleanliness</th>
<th>PWGS input cleanliness level (CL)</th>
<th>Hand washing process</th>
</tr>
</thead>
<tbody>
<tr>
<td>KPI 1</td>
<td>Washing station water cleanliness</td>
<td>PWGS input cleanliness level (CL)</td>
<td>Hand washing process</td>
</tr>
<tr>
<td>KPI 2</td>
<td>PWGS input cleanliness level (CL)</td>
<td>Housing input CL</td>
<td>Piston input CL</td>
</tr>
<tr>
<td>KPI 3</td>
<td>Hand washing process</td>
<td></td>
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</tr>
</tbody>
</table>

**Conclusion & Future Work:**
- The posts modeling shows that the MBE is adapted to find the main contamination sources.
- A process optimization can be done with the controllable variable identification
- With the identified KPI, an experiment should be launched to measure their effect on the oil cleanliness

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