Position in University of Technology of Troyes

Collaboration: Worms Safety Alliance
Duration: 1 year

General framework

Quality Control or Statistical process control is an important and unavoidable step in production systems. This step is to be reinforced in order to produce high performance products. The main concept is to identify a quality index based on monitoring data and extract the statistical properties of this latter. Therefore, according to the obtained results, propose a quality management plan to improve the production in terms of quality index.

Industrial framework

- **Presentation**
  Worms Safety Alliance, based in Hong Kong, is dedicated to design the best solutions when it comes to Quality (Compliance, Risk Management, Disruption & Growth), including testing, inspection and certification. A large part of his operations consists in conducting inspection of items manufactured in factories spread over large areas in Asia, Europe and North America. It covers a diverse product ranges including household goods, textiles, automotive, aviation and healthcare.
- **Statistical process control in Worms**
  Today, inspection strategies are quite simple, based on the Acceptance Quality Limit [AQL] principle, as a 100% inspection of a batch is not possible. Once the production is completed, a sample according to this principle is carried out for the "passed or failed" inspection. The AQL principle is based on statistical mathematics with the objective of minimizing risks in the decision-making process (accepting a batch with a given percent defective higher than the expected one or rejecting a batch with an acceptable percent defective). AQL represents the maximum number of defective parts, beyond which a batch is rejected.
- **Statistical process control improvement**
  Beyond the AQL principle, an advanced quality management plan should focus on the product manufacturing lifecycle; prototype, pre-series, partial inspection, final inspection with corrective actions. Within a given quality budget, the allocation of the inspection resources has to be optimized concerning any direct and indirect costs. Especially, we are looking to provide a methodology that early detect quality problems in production to avoid a fail in final inspection. We state that early detection of defects in the batch joined to corrective actions - delays, repairs, order cancellation... - with quantitative impacts is most likely more optimal than awaiting the final inspection.

AIM

The aim is to improve the actual statistical process control using data analysis, statistical modelling and optimization.

METHODOLOGY

To address the issue the following steps are

- Bibliographical study statistical process control for similar production frameworks
- Historical data analysis and quality indicator extraction
- Quality index modelling
- Statistical process proposition
- Process cost modeling
- Audit cost modelling
- Inspection policy optimization

SCENTIFIC SKILLS

-Major skills Data science: machine learning, statistical inference, Monte Carlo simulation methods
-Incremental skills: statistical process control, signal processing, stochastic process, optimization

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