CASE STUDY

Material Handling Simulation Study Saves $900K

Customer Challenges

- Risk and cost with conveyor design selection
- High cost of pallets to be purchased
- Need for a visual and interactive simulation for 'what-if' scenarios

PROJECT SUMMARY

The client was designing a core production and transfer system for a foundry. Different parts of a core were manufactured in the area and then assembled into a final product. The parts of the core were transferred from the production cells to the assembly area over conveyors, on pallets. The purpose of the study was to verify the throughput and evaluate two different conveyor system designs for producing three different core assemblies. Reject and scrap rates were factored and machine downtimes and repair times were included in the analyses. The best conveyor design was tested using simulation, and the number of pallets required for smooth production was estimated.

SYSTEM DESCRIPTION

The system was designed to manufacture core assemblies for the foundry.

1. Crankcase core production area
2. Waterjacket core production area
3. Tappet core production area

Crankcase cores were machined at three cells before being transferred to the assembly area on pallets moving on conveyors. These cores are transferred over three different conveyor loops. Pallets are local to a loop and are returned using over-under type conveyors. Similarly, waterjacket and tappet cores are produced in their own areas and transferred via pallets on conveyors to the main assembly area. At the assembly area the water-jacket and tappet cores are assembled to the crankcase cores. The completed assemblies are transferred out of the system. Three different assemblies were produced, with the differences stemming from assemblies' composition; the presence or absence of the waterjacket and tappet cores, and the number of each of these cores on the final assembly.

OPPORTUNITY

Our simulations are commonly used in the evaluation of conveyor system design, and for optimizing the number of pallets in systems, where the cost of pallets can be high. In this system, two different conveyor designs had to be evaluated for producing three different products, subject to a number of variable parameters such as operation cycle times, station downtimes, repair time duration, scrap rates for cores, conveyor speeds, number of pallets, and conveyor operating logic.

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APPROACH

The primary objective of the simulation was to verify the throughput capability of the production system for the two conveyor designs, subject to all the variable parameters mentioned above. The secondary objective was to optimize the number of pallets in each conveyor loop in the system. A third objective was to develop a spreadsheet interface that would allow for changes to be made to the key parameters easily, as the system evolves, so that the simulation models can be used on a continuing basis.

SOLUTION

Six different simulation models were built for the three products being produced using one of the two conveyor designs. Each simulation model was analyzed independently to predict the throughput capability and to optimize the number of pallets. Key parameters, such as the operation cycle times, downtimes, repair times, and scrap rates, were held constant across the simulation models. However, the frequency and duration of the station downtimes were randomized in order to model reality closely. It was shown that both conveyor designs were capable of satisfying the desired demand based on the system parameters. The number of pallets was optimized.

BENEFIT

The simpler conveyor design was selected, as this was the least expensive alternative. This led to a saving of $600,000; about 30 pallets were also saved overall. The cost per pallet is not known. But since these pallets are also used as locators, they cost at least $10,000 per piece leading to a saving of $300,000. The total savings was close to $1,000,000. Also, verification of the design and detection of potential problem areas using the simulation animation saved time that would have otherwise been spent during implementation. An exact cost cannot be attributed to such intangible benefits.

Data-driven productivity solutions

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