A better-made blade

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In Singapore, robots help cut the turn-times of engine overhaul by more than five days below the industry standard. Not only do the robots save money, they also improve the safety for workers.

By Tony Sitathan
Photos Munshi Ahmed

> For Sean Ho of Singapore Aero Engine Services Private Limited (SAESL), achieving the Rolls Royce Component Overhaul Centre of Excellence Gold Award in recognition of Maintenance, Repair and Overhaul (MRO) of the 500 Rolls Royce Trent engine 18 months ahead of schedule was seen as a satisfying personal achievement.

"It took dedication, solid team effort and recognizing the need for early automation during the inception of SAESL that has made a world of difference," says Ho, the operations section head of the 8.5 million U.S. dollar compressor blade facility at SAESL. Compared to other Rolls Royce Component Overhaul Centres in other parts of the world which relied on manual processes, SAESL realized the importance for automation and became one of the first to implement ABB robotics in its MRO roadmap making it the first automated compressor cell repairing center globally, he says.

SAESL from the start realized the importance of delivering shorter engine turn-times – the time required to fully overhaul and process an engine – by under 60 days, quicker than the industry benchmark of 65 days. Currently it plans to further reduce turn-times to 55 days.

Ang Boon Hua, formerly the service engineer who was responsible for setting up ABB robots in the compressor blade repair facility back in 2004 and currently the senior sales engineer, says the implementation process was done in stages. He recalls that the configuration had been modified several times due to the complexity. "There were six stages of compressor blades that needed to be commissioned," Ang Boon Hua says. "And each stage of tuning the blade would lead to the configuration of over 200 robotic positions. In total there were more than a thousand robotic positions that needed to be configured. Another challenge was the need to customize the gripper, which acts to grip the compressor blade. It is designed to cater to multiple stages of blades as it cannot be designed specifically for one single stage of blade. They have to be adaptive enough to grip the blades in multiple stages." >

>FACTS

Service key to success

When the first Service Level Agreement (SLA) was signed in late 2007, Sean Ho was pleased with the technical response time and quick delivery of spare parts.

With an increase in customer traffic and more engines being serviced and overhauled, Ho says that SAESL is starting to see more engine parts coming in from overseas customers and not only from its predominant base of customers in Asia.

"We are seeing more external customers coming to us for their MRO solution. Almost 50 percent of business is from external customers and that trend is expected to grow in the future," he says. That, according to Ho, is seen as the silver lining in a highly competitive and fast-evolving MRO market where airlines, including Singapore-based aerospace companies, are starting to emulate the success of SAESL.

Improvements in the workflow processes reduce cycle time by four days.

Right from the start of the automation process, there was a prerogative to use only the state-of-the-art robotics from ABB. A careful selection of ABB robots was deployed over time, before the system went live. The IRB 2400L is used for material handling, picking and placing of compressor blades around different stations for welding and grinding of blade tips, including the IRB 140 that is used for blade tips lubrication material coating. The IRB 2400 in particular was selected for the picking and placing of compressor blade to and from the shot peening machine. The shot peening process is considered the most effective way to enhance the fatigue strength of components that are subject to extreme stress. The IRB 1400 was chosen for machine tending and to pick and place compressor blades to and from CMM for dimension inspection while the IRB 2400 is used for plasma coating and spraying of metal powder onto the engine components of build-up materials.

The benefits from deploying the robotic arms were almost immediate. According to Sean Ho, they reduce both man hours and the risks of humans working on transferring the blades from one production cycle to the next. "There is a higher degree of safety and fewer risks as compared to humans handling these aircraft parts and components in the most economical and diligent manner. Although the total return on investment cannot be easily measured since we have been using ABB robots from the start, there is a clear indication that using ABB robots has accelerated our workflow processes and our completion time," he says.

"Now it was possible to run operations 24 hours, seven days a week, slashing operational costs and downtime. This has contributed to higher costs savings," he says. He reveals that SAESL has spent almost 5 percent of its machinery and gear budget on ABB robots, which translates to less than USD 1 million in capital investments. There was ultimately a reduction of man hours by almost 10 percent and an improvement in the overall cycle time.

Due to the improvements in the workflow processes, Ho is proud of reducing the compressor blade repair cycle time by an additional four days. Instead of repairing the compressor blades within 21 days, Ho is now able to complete the process by 17 days. "We are able to analyze the data and the production processes more closely while scrutinizing the workflow more accurately therefore eliminating time wastage," he says. "It is possible now to calculate accurately the cycle and production time." By using SAESL's proprietary system developed in-house, as well as SAP R/3 as its benchmark enterprise resource planning and production software, he is able to rely more on outsourcing the overall maintenance of the repair facility by using OEM contractors and their agents.

Advantages with robots

- Reduction in man-hours of almost 10 percent, which ultimately led to lowering the costs of operations while improving productivity and lowering cycle downtime.
- Capable of delivering shorter engine turn-times of under 60 days, quicker than the industry benchmark of 65 days.
- Enhancement of the safety of workers and lower risks associated with movement of materials in the workflow processes.
- Lowered cycle time for repairing compressor blades from 21 down to 17 days.

SAESL in short

- SAESL was first incorporated in 1999 and is jointly owned by SIA Engineering Company (50 percent), Rolls-Royce (30 percent) and Hong Kong Aero Engine Services Limited (20 percent). It undertakes the repair and overhaul of Rolls-Royce Trent aero engines around the world and forms an integral part of the Rolls-Royce aftermarket service.
- Current clients include Singapore Airlines, Emirates, Virgin Atlantic, Malaysia Airlines, Thai Airways, South African Airways, Garuda Indonesia and Air Canada.
- The company employs close to 600 employees with plans to further recruit 150 more employees within two years.
- Sales was around USD 400 million in 2006 and is expected to increase above the industry average for 2007.