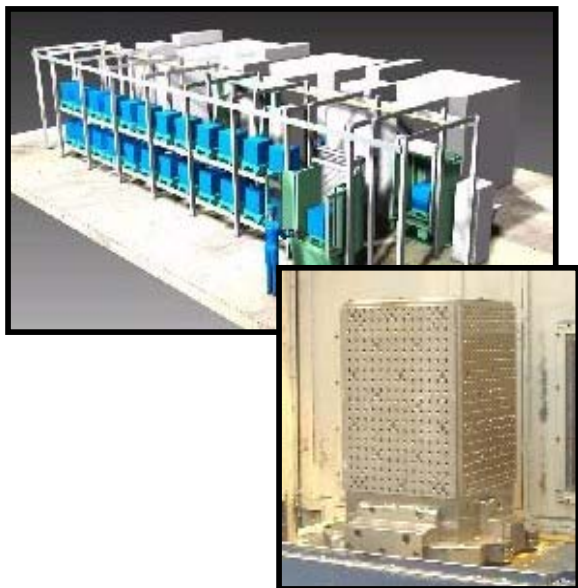


Airbus wing production benefits from WITNESS driven production efficiencies



Airbus is one of the world's leading aircraft manufacturers and the UK is its centre of excellence for wing design and manufacture. One of two sites in the UK, the company's manufacturing facilities at Filton, Bristol play a key role, producing in excess of 5,000 different parts for aircraft wings across an extensive range of aircraft families - including the A380, the world's largest civil airliner.

In an increasingly competitive marketplace, the need to ensure its operations are efficient and cost-effective is amongst the highest priorities for Airbus.



When Filton's IMF (Integrated Machining Facility) 'Current Projects' team decided to introduce a Flexible Manufacturing System (FMS) in one of the manufacturing cells, designed to achieve significant cost reductions across the operation, they turned to WITNESS simulation software to answer a number of critical pre-implementation questions.

Engineers design the parts and send the resulting CAD drawings to manufacturing cells where the parts are then produced.

The workshop receives solid pre-formed metal billets (made of aluminium, titanium or steel) from external suppliers. These are loaded onto machining cubes, then inserted into the CNC machining centres for processing, which can take between 1 and 15 hours on this cell, depending on the part type. The finished parts are then subjected to a variety of treatments (for example heat and surface treatment), prior to despatch to assembly.

The project team wanted to automate the line that was originally comprised of a combination of machines and manual operatives who load and unload billets into the machines. With one operator to a machine and regular occurrences of significant downtime, this was an obvious target for cost reduction. They felt that a possible solution lay in finding a common means of loading and unloading 4 of the 7 machines on the line, which would reduce costs for the process and allow the existing operators to be more usefully deployed onto other, more satisfying, tasks.

"WITNESS was able to rapidly calculate over a 12 hour shift how long each cube had been used for, the length of time that it was inside the machine and review how this would work with over 115 different parts each with differing characteristics in their cycle times".

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Company	● Airbus
Industry	● Aerospace
Application	● Production line process improvement
Benefit	● Cost Reduction

Via a proprietary rail-guided modular multi-level pallet loading transport system, a robotic crane going back and forth would attend all 4 machines. All the jobs are stored on nearby storage racks, so the Rail Guided Vehicle (RGV) would collect them from a manual loading area and take them to be worked on inside the machines, before returning them to the storage racks.

“WITNESS was able to rapidly calculate over a 12 hour shift how long each cube had been used for, the length of time that it was inside the machine and review how this would work with over 115 different parts each with differing characteristics in their cycle times. Some cycles are staged requiring varying levels of manual intervention. Some parts can stay on the machine for many hours so we needed to quickly and accurately gather results from simulating multiple complex scenarios” explained Rui Furtado, Project Leader for this pilot project.

With a strong emphasis upon lean manufacturing, the Airbus project team needed simulation to also determine:

- How many storage racks are required?
- How many cubes will be needed?
- How many loading stations should there be?

and understand the likely effects of changing any of these variables, including possible loading station blockages.

Billets can be loaded onto the cubes’ all four sides. Each of the sides provides an individual work area, upon which a wide range of part types, each needing engineering to individual specifications, are worked on.

In this way one machine has the potential to work simultaneously on differing parts each with:

- Varying machine times
- Differing tool requirements
- Individual specifications

The machines have capacity for 120 tools out of an almost unlimited number of different tools available. This is part of a huge array of variables, which include the different types of metals, shapes, sizes, quantities, varying delivery schedules, and differing aircraft. WITNESS is ideally placed to quickly and accurately optimise just such a wide assortment of possible production scenarios to assist the decision-making process.

During the production process of some wing parts, on average only around 10% of a material billet is left after it has been shaped during machining, with the waste material being recycled. When the machine is working on a part, the operator’s role is minimal so the process offered potential for increasing job satisfaction if alternatives could be found, as well as the possibility of significant cost saving.

Using WITNESS, Airbus was also able to experiment with factors such as the probability of flawed billets and different tool lives.

Based on parts passing through the process in a given week, WITNESS optimised a typical work tool list comprising certain known variables such as:

- The work schedule
- The quantity required
- Its composition
- When it was required
- Each part requires a left and right version



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Airbus was also able to evaluate the shift patterns for operators loading and unloading the machines, with a view to increasing the occupancy rate of the machines. The team wanted to move to 'lights out running (LOR)' wherein the cells were not 'manned' 24 hours a day, with all jobs to be done loaded onto the available cubes and into the storage racks prior to unmanned operation. This would deliver considerable resource savings for the process, yielding approx. 80 to 90% utilisation of the machines.



"The ability to use WITNESS to apply "What-if" questioning to any of these variables allowed us to pose questions such as:

- Could we have a work-tool list that stipulated the tools required for the week ahead?
- Should you handle similar specification jobs simultaneously or mix them?
- If you mix them, then what is the best combination throughout the day to achieve an optimum workload?
- How best should that be scheduled?
- What is the most effective way of utilising a cube, given that not all sides have to make the same part at the same time?
- How do you feed a cell day and night?
- Considering that a single billet (piece of unworked metal) might be worked upon by a varied array of tools and may have to go back into the machine for further working – what is the best way to handle this scenario?
- The cell is targeted to produce 115 parts

and showed us that the cubes could be vastly under-utilised. We also ended up with an effective workable schedule of long, short, long jobs sequence. This was achieved by running long runners, overnight to maximise machine availability given the limited number of cubes. Manual intervention is required after machine operation is over. In the morning, at start of shift, feed the long-runners again because whilst this took place, time was then available for the cubes in the racks to be unloaded. During the day, feed the short-runners, as operators are at hand" explained Rui Furtado.

"Given the cost of each cube is £25K, achieving highly accurate results was essential and the use of WITNESS simulation indicated that we needed at least 12 cubes as a basic requirement, in these current circumstances," said Rui.

"Through the use of WITNESS we were able to see gains of 10-15% on using 4 – 5 cubes; 10% on using 5 – 6 cubes and then minimal gains thereafter. Simulation provided us with the insight to stop adding further cubes without justifiable gains. We were able to simulate a week's work on one cell for 6 weeks to give a good flavour of the whole cycle and cube utilisation and wear and tear. As a result we decided to purchase a further 4 cubes to supplement our existing ones" explained Rui.

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