Reverse Engineering for PLANNED PREVENTIVE MAINTENANCE

What technology can be applied to reverse engineering?

There are a number of technologies that can be utilised to capture data accurately. The primary systems we employ are:

What is Planned Preventative Maintenance (PPM)?

PPM or Planned Maintenance (PM) is a scheduled maintenance programme designed to maintain high value assets.

PPM is not the lowest cost maintenance programme. It is usually built into the operational plan as an insurance or preventative programme, to reduce the risk to high value manufacturing processes or operations that rely on the reliability of machinery.

The cost of the PPM is off-set by the fact that if the machinery fails unexpectedly the ‘down time cost’ due to lost production or interruption of critical operations, such as in the maritime environment, would far exceed the maintenance programme costs.
• **3D non-contact optical measurement: GOM ATOS System**
This system is a white or blue light optical scanner that scans 3D objects and converts the images into high density point cloud data.

• **3D non-contact optical measurement: GOM TRITOP System**
The TRITOP system takes high resolution 2D images of an object and creates an accurate 3D coordinate framework based on digital photogrammetry techniques.

These systems can give a resolution in an uncontrolled environment of 50 microns per meter cubed. In controlled environments this resolution can be increased further. It also has the advantage that the object being scanned and the scanner do not have to be secured for scanning (although they do need to be stationary for the duration of each scan (10 seconds), having virtually unlimited reach, unlike some other systems available.

As with all optical systems data can only be collected on features where there is a direct line of sight to the geometry, unlike CT scanning that can capture fully enclosed internal features.

• **CT Scanning:**
Industrial CT scanning is a process which uses X-ray equipment to produce three-dimensional representations of components both externally and internally. Industrial CT scanning can be employed in many engineering sectors for internal inspection of components.

The key uses for CT scanning are flaw detection, failure analysis, metrology, assembly analysis and reverse engineering applications.

The key to using any technology is that it is applied to the right challenge to give the best solution.

The captured data can also be used in optimisation processes such as Computational Fluid Dynamics (CFD) or Finite Element Analysis (FEA). If you would like to learn more about any of these other options we will be happy to discuss them with you..
Where can reverse engineering support the PPM programme?

• Legacy Equipment
Many manufacturing businesses still operate machinery that was built in the ‘pre-digital’ era. These machines are often a bespoke design for a specific operation or no longer in production, with spares either scarce or unavailable. The equipment though old is however usually very effective and efficient, and replacement would be incredibly expensive and potentially not viable, including the ‘down time’ of the operation during replacement.

Many operators do not realise that with modern data capture technologies, such as white light scanning and CT-scanning, parts can be recreated as 3D CAD models to ‘reverse engineer’ and digitise major components or complete assemblies of equipment with incredible levels of fidelity to the original part.

This data can then be used to manufacture replacement parts or spares. Through the use of these technologies, we can potentially extend the life of the equipment indefinitely or to the point when investment in new equipment becomes a more viable option.

These technologies are not necessarily cheap, however if the correct technology is applied to deliver a solution, the savings to a company in production costs and the reduction in risk of catastrophic failures, and therefore asset replacement, make this a viable and cost effective insurance.

• Spares and Part Replacements in new out of warranty equipment
After making a major purchase of high value or bespoke equipment, the operator can find that the replacement of parts can have a number of challenges, including:
• Long lead in periods for delivery.
• High cost of spares due to the manufacturers’ monopoly on the equipment.
• Large cost of spares due to a whole assembly having to be purchased rather than just replacing the part that is defective.

We can capture the data from original parts and hold that data in a digital archive until such point as the client requires it. We can then use this data to create 3D CAD models and manufacturing drawings and then manufacture a new part at a potentially lower cost and with shorter lead times to meet the clients’ deadline. If you wish the parts can also be optimised to improve their performance for the job you require or increase life and efficiency.

• Equipment Optimisation:
This is the process of improving the performance of a component or equipment where digital data and drawings are inaccessible or simply do not exist. We would therefore have to capture the part’s geometric data to start the optimisation process.
When is the best time to use this process?

The data capture and reverse engineering process can be delivered in stages to suit your time lines and budgets.

The first and most important stage is to capture the geometric data in the most cost effective way, and this is generally during the PPM programme. It should be noted that to capture the data of a complete equipment assembly, all the parts will have to be scanned individually and therefore choosing a major maintenance period with a total ‘strip down’ may be the best and most cost effective approach.

Once the data has been captured it can be stored in a digital archive until required. The data can of course be utilised immediately and used in the next stages of the process depending on your requirements or urgency.

PPM does not always prevent the breakdown of equipment and we can of course react quickly to capture data of broken part or parts, import the data into the CAD system, and produce manufacturing drawings and information to be in a position to have your spares manufactured.

Where can the data be captured?

We can capture data on or off site. If the parts can be transported we can deliver a bureau service at our site or at our manufacturing partner’s facility.

Note: The data capture process creates a 3D file that on its own is just ‘dumb data’ and for the data to be processed it must be imported into the CAD system and manipulated to allow the design process to take place.

If you would like to know more about this process and how it can be applied as a solution for your business, then please contact us to discuss your requirements.

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