Cleaning Cylinder Head Castings

The Advanced Forming Research Centre & a diesel engine manufacturer

A Scottish Institute for Remanufacture Case Study

Cleaning in Remanufacturing Process

The process of remanufacturing involves disassembly, cleaning, inspection, restoring components, testing to ensure that it is meets original design specifications and finally, issuing a warranty to match that of a newly manufactured product.

As part of the cleaning process the core is stripped and any dirt or residue is removed to allow thorough inspection and restoration. In many sectors, particularly those involving heavy engineering, ie automotive, the cleaning process can be laborious and time consuming as the substances that cling to the surfaces can be hard to remove and require different chemicals dependent on the type of residue.

The results of testing alternative cleaning methods show that a new process could increase productivity and save £30,000 per annum.

Project Background

As part of their continued drive to innovate and improve their remanufacturing operations, a leading diesel manufacturer sought to investigate a new process for removing carbon deposits from the cylinder heads of 19L engines improving efficiency whilst meeting HSE guidelines for chemical safety.

They recognised that determining the efficacy of a new process required a rigorous academic approach with specialist knowledge of metrology and metallurgy. Furthermore it was essential that an independent party conducted the review of potential cleaning methods. These attributes were not readily available within the commercial sector.

Working with the Advanced Forming Research Centre (AFRC) and utilising funding from SIR, methods for carbon removal were identified and after research, two were selected to be tested for efficiency, processing time and cost.

CO2 Blasting Method

The first method tested was CO2 (or dry ice) blasting and was found to be effective in removing the surface deposits but demonstrated limited success in removing the residue in the complex internal passageways of the cylinder head. The process was costed at £120 per cylinder head with a 1 hour 20 min process time including set up.

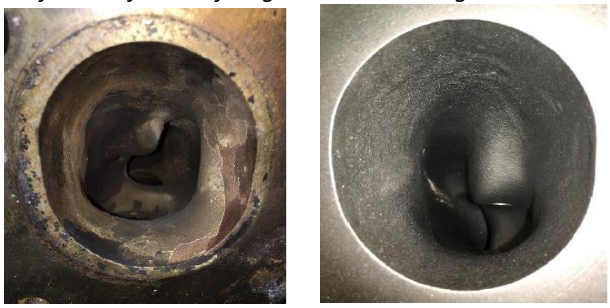
Surface before and after CO2 blasting

Glass Bead Blasting Method

A second method utilising glass bead blasting was also tested and delivered excellent results in removing the surface deposits and caused no damage to the inner workings of the cylinder.

Blast residue was found to be present in internal bores; however, it was identified that a post blast wash would eliminate this.

Surfaces before & after glass bead blasting

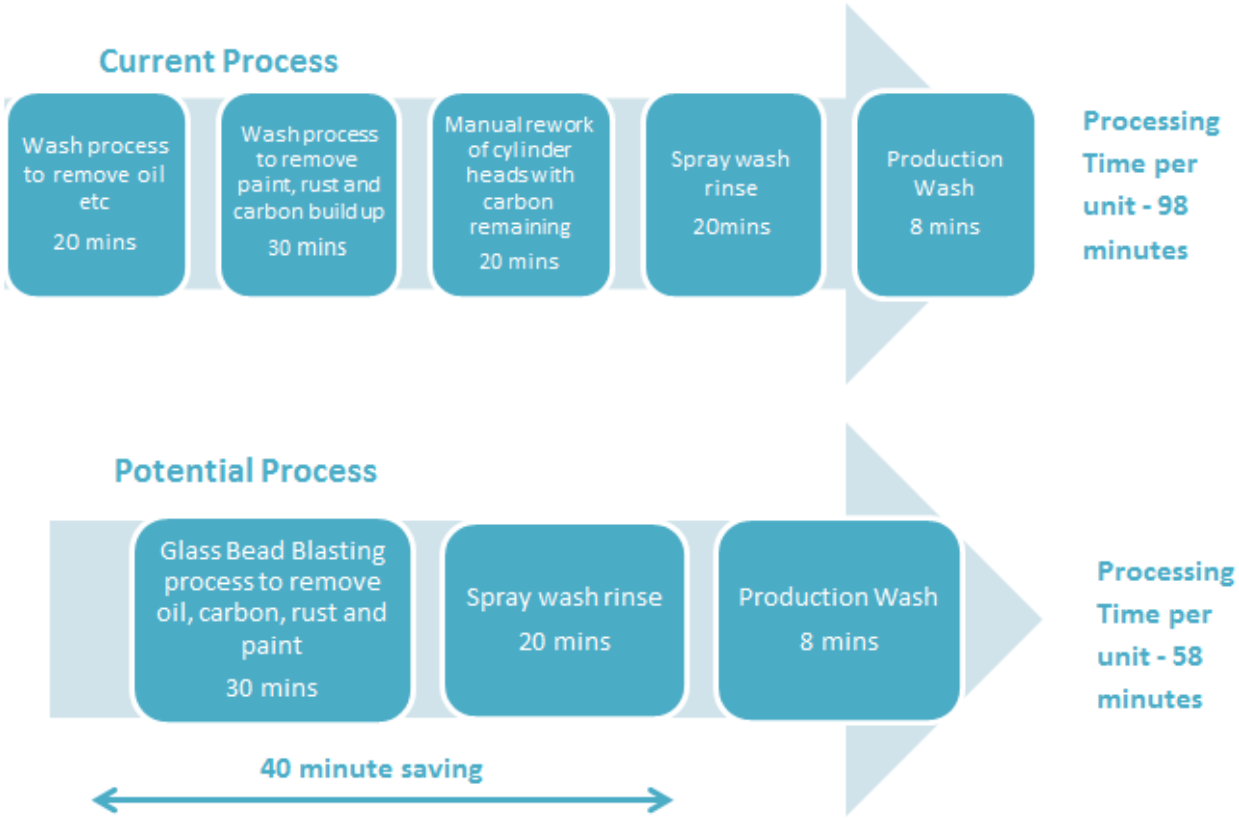


Results analysis

Testing of the surface treated with glass blasting was carried out using microscopy technology and confirmed that the method was non-abrasive and caused no damage to the surface of the cylinder heads.

As this process was forecast at a similar financial cost to the CO2 blasting (£125 vs £120) but with a shorter processing time of just 30 minutes and more effective results, it was concluded that this method should be further analysed against the process currently used for cleaning cylinder heads to demonstrate potential improvements.

A comparison was undertaken between the company's current cleaning process and the glass bead blasting process where it was demonstrated that adopting the glass bead blasting process had the potential to remove two steps from the current remanufacturing process saving 40 minutes per remanufactured unit.



Benefits

The glass bead blasting method is quicker and requires less manual effort improving process efficiency and could lead to a £30,000 per annum saving compared to the current process.

There are also environmental benefits associated with this process as the glass beads could be derived from 100% recycled glass and used for 30 cycles before replacement leading to an increase in material reuse. In addition, less chemicals are required in this process as a result of removing two wash cycles from the current process.

The initial expense to set up glass bead blasting was investigated and found to be less than £5,000 demonstrating a good time saving for comparatively little outlay.

The project findings could be replicated in other sectors to reduce chemical usage whilst improving processing time and staff deployment.

For more information on the funding opportunities available through SIR visit our website www.scot-reman.ac.uk , email us sir-enquiries@strath.ac.uk or follow us on twitter @SIRemanufacture

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