Superior plant availability and cost efficiency

Optimized fine-cleaning of cylinder crankcases using an EcoCflex 3M robot cell

By adding a second production line for approx. 1,200 cylinder crankcases, Volkswagen Sachsen GmbH's Chemnitz-based engine plant raised its daily capacity to a total of 3,200 engine blocks. The fine-cleaning operation on the new line is performed by an EcoCflex 3M robot cell. Its CNC-controlled SCARA-Manipulator developed specifically for use in part cleaning systems provides enhanced plant availability and cost efficiency.

The Chemnitz engine plant of Volkswagen Sachsen GmbH, a subsidiary of Volkswagen AG, produces all main engine parts for the company's modern 3- and 4-cylinder spark ignition engines (TSI, CNG, hybrid) including engine subassemblies such as, e.g., balancer shafts. In 2015, this factory manufactured and delivered approx. 770,000 engines to Volkswagen Group's vehicle assembly plants. The facility is divided into mechanical machining, engine and component group assembly as well as service operations. Its production workflows rely on high-technology machining centers, technically demanding, sophisticated assembly lines, advanced test centers, and a workforce trained for excellence.

SCARA-Manipulator and CNC control prompted the investment decision

In the context of an upgrade for a new product generation, the company invested in a final cleaning system for its cylinder crankcase production. An innovative EcoCflex 3M robot cell made by Ecoclean is integrated here for the fine-cleaning step. As regards the selection criteria for the cleaning system, it was required to reliably fulfil part cleanliness levels meeting the stringent residual contamination limits specified in VW's 01134 standard in terms of particle size and residual dirt quantity, in addition to delivering a burr-free product. High cost-efficiency, ease of operation and plant availability were additional key points. The 6-axis jointed-arm robots commonly used in robot cells fail to achieve the special requirements placed on cleaning systems in the long term. Therefore, the company had to replace them at quite short intervals, at the expense of plant availability and cost-efficiency. Ecoclean was the only equipment manufacturer who, with their new SCARA-Manipulator, offered an alternative designed specifically for the wet section. Designed for booth temperatures up to 65 °C, the SCARA-Manipulator is built entirely of aluminium and special steel and therefore does not need a protective suit. Moreover, with its IP 69 protection class rating, the robot resists high-pressure water jets up to 600 bar and it is submersible. The cleaning chemicals employed are freely selectable and interchangeable in the 6 – 10 pH range.

What convinced the customer, however, was not just the handling system itself but also the control solution. Instead of using separate robot and PLC plant control systems, as is commonly the case, the EcoCflex 3M features only a single CNC controller for the SCARA-Manipulator and the cleaning machine. Since the control technology is common to all machine tools, it allows greater user-friendliness and allows operators to program the equipment without any special expertise. As a further advantage, the sensors for calibrating the SCARA-Manipulator are already integrated. This makes the system easier and faster to maintain and to re-start after a workpiece change.

Ecoclean GmbH
Mühlenstraße 12
70794 Filderstadt, Germany

Tel +49 711 7006-0
info.filderstadt@ecoclean-group.net
www.ecoclean-group.net

Optimum fine cleaning through effective process technology

The fine-cleaning step is performed on the die-cast aluminium cylinder crankcases with their grey cast iron cylinder liners and bearing caps after the final inspection. The aim is to remove any residual microdosage lubricant as well as aluminium or grey cast iron particles that may still adhere to the parts. In order to ensure this, the EcoCflex is equipped with a specially adapted spraying system having spray boxes that form a negative image of the workpiece. This configuration allows fluid to be selectively applied to all blind holes and pressurized oil passages so that the exacting cleanliness specifications can be fulfilled. The cleaning and rinsing fluid is then directed straight into the reconditioning system, avoiding any recontamination during removal of the product.

Efficient vacuum drying without air blow-off cycle

Upon completion of the cleaning operation, the SCARA-Manipulator places the cylinder crankcase on a transfer station. From here, the part is moved to and placed in the EcoCdry dryer module by a handling robot. The new high-efficiency vacuum dryer provides complete drying of the part surface without any prior air blow-off cycle. By eliminating the compressed air pre-drying step in the part handling process, the customer managed to include the treatment time within the 45-second overall cycle and saved the costs of compressed air.

To this end, the EcoCdry is equipped with an accumulator vessel in addition to the usually employed vacuum pump. During the very short idle times, the pump generates a vacuum in this vessel which is then used to abruptly evacuate the actual drying chamber once it is closed. The very strong airflow thus created reliably extracts any water adhering to the part and delivers it to the tank via a pipeline. After this operation, the existing vacuum is raised to 30 mbar for effective full drying.

The ability to achieve the specified cleaning result reliably in three-shift service is not a unique feature of the new machine; its uniqueness lies in the superior availability, improved user friendliness and cost efficiency.

Ecoclean GmbH
Mühlenstraße 12
70794 Filderstadt, Germany

Tel +49 711 7006-0
info.filderstadt@ecoclean-group.net
www.ecoclean-group.net

Contact:

Ecoclean GmbH, Monschau, Germany
Phone +49 (0)2472 83 – 0
sales.monschau@ecoclean-group.net
www.ecoclean.net

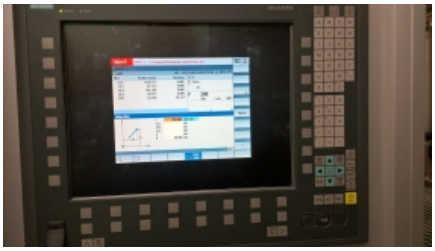
Author: Doris Schulz, 2015

Bildtexte / captions

Photo: DE_Scara_Totale_1

Rated for protection class IP 69 and in-booth temperatures up to 65 °C, the SCARA-Manipulator, unlike its 6-axis jointed-arm counterpart, is built to withstand the harsh conditions in part cleaning equipment.

Photo: DE_EcoCflex_CNC-Steuerung



Instead of the commonly adopted separate control systems for the robot and the cleaning machine, the EcoCflex 3 relies on a single CNC controller serving both. This feature makes for simpler and faster programming, operation, maintenance, and re-starting after a part change.

Photo: DE_EcoCflex komplett

The cleaning and drying functions are separated. Drying is performed in the new EcoCdry vacuum dryer which does away with compressed air pre-drying. Part handling is thus reduced, and more treatment time is freed within the 45-second overall cycle time.

The SBS Ecoclean Group (former Dürr Ecoclean) develops, manufactures and distributes future-oriented machines, systems and services for industrial parts cleaning and surface processing. These solutions, which are technology leaders, support companies around the world to manufacture their products efficiently and sustainably in high quality. The company's customers come from the automotive and supplier industry as well as from the broad and diversified industrial market, such as medical engineering, micro manufacturing, precision mechanics, machine building and optical industry, aerospace and aviation as well as energy technologies. Ecoclean's success is based on customer focus, innovation, cutting-edge technology, sustainability, diversity and respect. The company has twelve sites worldwide in nine countries with approximately 900 employees.

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