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## The largest **ZIPPEL**-Cleaning Machine for Engine Blocks

In order to remove soilings from oil/water duct drillings in engine blocks by means of high pressure ( 800 bar), the largest cleaning machine developed so far with the maximum dimensions of approx. 20 x 8 x 7 meters was integrated in an already existing production line for engine blocks. The engine blocks weighing approx. 230 kg are cleaned according to the standard for residual dirt demands in the automotive industry. The cleaning machine consists of three cleaning systems:

**Immersion cleaning system T2-150-1-LB:** This machine type consists of one cleaning- and one drying chamber and the cleaning is realized by an immersion process. Main spraying strings and spraying strings placed on the bottom as well as a nozzle beam are installed in order to clean the work pieces extensively and to remove coarse dirt particles from the floor. The parts to be cleaned are led in automatically by means of an inlet transport roller conveyor, then they are removed from the inlet roller conveyor by a portal, and finally they are put into the washing chamber and tightened firmly. The rotation unit provides for both an admission and cleaning on all sides by means of flat jet nozzles. A nozzle box is driven up to the work pieces for a directed cleaning of the drillings. Once the cleaning process has been completed, the second portal lifts the component out of the washing chamber and then it is delivered to the drying chamber, where the part is impinged on and dried completely with preheated air by means of a rotation unit. In the drying chamber a blast register and a nozzle beam are to be found, which are responsible for the drying of the crankshafts. The parts can be tightened firmly in a hydraulic manner by means of a rotation unit. The cleaning- and drying chambers can be locked by pneumatically working lifting gates.

The transfer of the parts to the **chamber cleaning system K2-100-1LB-T-DS** is realized by means of a roller belt. In this machine the cleaning process is effected in an immersion- and spraying process. Main spraying strings and spraying strings placed on the bottom are installed in order to clean the components extensively. The work pieces are transported by inlet/outlet transport roller conveyors that can be docked. The drying chamber contains blast registers which dry the components, whereas rotation units are to be found in the chambers. The cleaning- and drying chambers can be locked by pneumatically working lifting gates. The subassemblies can be easily dismantled by a hoisting gear for the realization of maintenance operations. After this cleaning process the parts are placed on a conveyor belt and transferred to the

**ECO-Robot-Power-JET T-8.** The T-8 works as an inline-, spraying-, immersion- and drying system, which means that the components are picked up from the transition belt by an H-loader and after that they are deburred by means of high pressure in the chambers in accordance with the cycle time. This process is realized by spraying nozzles, ultrasound and injection-flooding in a clockwise and anti-clockwise rotation by means of robots. After the end of the cleaning cycle the parts are lifted and before they get into the next washing chamber, they are emptied in order to reduce the amount of dirt carried into the next station. The parts are moved from one station to the next one by a linear portal. The different stations of this machine work permanently.

## Preparation of the Cleaning Media

In order to reach a maximum life time of the cleaning bath, the water is separated from coarse dirt particles by a chip conveyor before it gets back into the tank. The cleaning medium is filtered with filters of 100 respectively 50 µm. Electronic differential pressure displays in collaboration with a gravity oil separator are to be found at these filters. This oil separator alternately sucks off the deepwater or the oil floating on the surface of the tank, purifies the water and leads it back to the tank.

