

# Case Story.

Volkswagen.



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## Light wings for the Phaeton.

**Volkswagen, the automobile producer, plans to increasingly use light-weight components in the future. As a test, VW is manufacturing doors for its flagship model Phaeton in its factory in Kassel. The result: Volkswagen is thrilled by the die casting process and the two-platen die casting system Carat 440.**

The pressure resting on the carmaking industry to cut the carbon emissions of its vehicles is continuously increasing demand for highly integrated light-weight components. In this effort, structural components are playing an ever-more important part. In Volkswagen's factory in Kassel, far-sighted minds proved that a Bühler die casting system is capable of casting complex structural components of top quality so to speak at the push of a button.

### **Today: Classical cast components**

Volkswagen's factory in Kassel has been manufacturing engines and gearboxes since 1958, processing over 100,000 metric tons of aluminium a year in Europe's largest aluminium die casting foundry. With its 15,000 employees, the factory also supplies the 45 million cars it has manufactured and are still on the road with 372,700 different genuine spare parts. The light-alloy foundry specializes in manufacturing gear-boxes, that is, "classical" die cast components of relatively large volume and respectable wall sections.

### **Tomorrow: Light-weight design**

Just like the time when the self-supporting car body was launched and thus a milestone was reached on the road to integration, another revolution is currently taking place. Called "light-weight design," components are being developed which fulfill several functions at once and thus address one of the core challenges: weight reduction with the aim of enhancing energy efficiency. Such structural components have complex, rather large geometries and are increasingly being made of light alloys such as aluminium or magnesium. Bühler as a supplier of die casting systems is forging ahead with the development of this technology.

### **Casting structural components**

In 2010, the factory management of Volkswagen Kassel inquired whether it might be possible to cast structural components in a standard casting cell designed for

making gearboxes, which would at the same time allow the capabilities of the die casting process to be "fathomed." Although basically the same systems are applied, the requirements that the cast parts are expected to meet in this application are very much higher than – say – in making a gearbox. Because a structural component integrated in a vehicle must absorb high energies in the event of a crash, high mechanical strength and elasticity values are required. In addition, its suitability for certain joining or assembly techniques must be taken into account, for example bonding or welding. Beside known process operations, this calls for adequate flexibility in selecting the settings for designing the shot profile. The long-term goal is to achieve low-cost casting of structural components that can be directly assembled without requiring any subsequent machining.

### **The test: The Phaeton door**

"Which part in the current production portfolio is sufficiently large and complex to provide an answer to the questions asked?" The reply: The door frame of the largest VW model, the -Phaeton, and that in the standard as well as in the long version. For the test, the Bühler two-platen die casting machine of type Carat 440 with a locking force of 44,000 kN was applied, which went into service in February 2011. Project manager Karsten Bätzing puts the result in a nutshell: "Things worked virtually right the first time. From the fifth shot onwards, the system was delivering perfect quality." What was also perfect in view of all the requirements that must be satisfied in such a project was the surprise of everyone involved. Today, Karsten Bätzing would not hesitate to cast an even more sophisticated component, the door sill: "...but at present we do not have the required production capacity. We are casting gearboxes around the clock on the new Bühler Carat in order to meet the enormous demand."

### **What steps come next?**

"Everyone was so enthusiastic that we decided to cast the entire lot of 4,500 doors, and this with a far higher productivity than expected," says Karsten Bätzing proudly of the performance achieved. Manufacturing manager Gerd Hahn agrees: "We would never have expected to achieve our goal in such a short time." "This demonstrates that standard casting cells are capable of casting both structural components and 'classical parts'. To achieve the required flexibility, we are working on



The two-platen die casting system of type Carat 440 in the Volkswagen factory in Kassel.

implementing a standardized casting cell,” explains Gerd Zahnwetzter, who heads the Planning and Technology Center. “Not least, the people from Bühler have persuaded us to drop the open machine control system applied up to now.” The short-term possibility of an open control system, which consists in “working around” errors on the basis of simple manual interventions, is offset by the long-term drawback that every machine may have undergone different, possibly non-documented adjustments. “When casting a component, we want to switch to other machines whenever we want to; we want to benchmark; and we want to know on the basis of which parameter an individual casting exhibits certain deviations. This requires total retraceability. The analysis options of the Bühler systems support us to a great extent in this effort.”

#### **What does VW expect of Bühler?**

“...small, light-weight, energy-efficient, and easy to operate...” To operate a die casting machine, you need space, energy, and operators. The space issue can typically only be solved in theory by building a large factory hall on a green-meadow site. But in everyday practice, the challenge is to increase productivity while production continues by replacing an old machine by a new one with a higher capacity but the same footprint. Furthermore, this higher-capacity machine is not allowed to consume more energy – on the one hand in the interest of sustainability, but not least also due to the electrical connection values. Gerd Zahnwetzter: “This is one area where the two-platen technology of Bühler

helps us as much as it does in meeting our flexibility requirements in selecting the process parameters and ensuring ease of operation. We also expect our suppliers to provide know-how and service. Even before the supply, Bühler repeatedly asked us questions, which we occasionally found inconvenient, but which ultimately paid off. And not least, we expect fast responses in case of trouble. When a machine stops producing parts, every hour that we can reduce downtime is worth pure cash. And of course I am very pleased to see that employees back our decision and enjoy working on the Bühler machine.”

Karsten Bätzing,  
Manager of the  
“Phaeton Door” project  
at Volkswagen



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