

## KUKA Aerospace Solutions

### How is the wing joined to the fuselage?

Compared with, say, the Automotive Industry, automation in the Aerospace Industry is still in its infancy. During this exciting phase, in which many things are only just being developed, KUKA Systems is at the head of the field with the Aerospace Division.

#### **S-TEC Sales Manager Markus Schmid and Product Group Manager Markus Gruber describe the tasks and special requirements that are involved.**

What are the tasks of the teams in the KUKA Aerospace Divisions? Automating the production of aircraft elements and propulsion components is a highly complex task. The main focus is on joining tasks in structural assembly, i.e. the assembly of fuselage and wings, including add-on parts, and various welding processes for power plant components. New materials also require new processes and the mostly very large workpieces entail different logistical operations for transportation.

#### **Core competency engineering**

The most important service we provide our aerospace customers worldwide is engineering. Customers generally expect complete solutions. It is not just automation solutions for individual production steps that are sought after, but the creation of manufacturing concepts: the task here is to combine the individual processes to form an efficient, overall concept. This know-how in drawing up complete solutions is the focal point of KUKA's range of services. Our expertise in the principles of automation gives us an outstanding advantage in this field. Moreover, our experience makes us a partner that can help this branch of industry to develop itself further on two levels. Firstly, we take elements from automotive production and integrate them into our systems, thereby ensuring that the processes are stable and reliable. Secondly, our customers learn with us, during this process, how to design an aircraft in such a way that production can be better automated – thereby saving the customer money, effort and time.

#### **Everything is special: materials, processes, logistics**

A number of exciting tasks arise, not least due to the use of new materials, such as carbon composite. Two-sided joining processes are the norm for this material: drilling is carried out and rivets inserted on one side, with the mating part, the collar, on the other side. The tool developed for this is a multi-functional end effector – a complex machine that sits compactly on the robot wrist and drills, measures, positions the corresponding rivet or collar, applies sealant and then fastens the rivet. We are currently working on systems for the cockpit section of a large American civilian aircraft. This is where a second major topic comes into play – logistics. Unlike in the automotive industry, where vehicle bodies are relatively easy to handle, workpiece dimensions in the aerospace industry are enormous. A multi-section aircraft fuselage can have a length of 80 meters or more. Transportation of a wing measuring 30 or 40 meters is an extremely tricky task. For this reason, we develop concepts in which it is not the workpiece, but the automation equipment that is moved. In the case of an aircraft wing, for example, this equipment consists of a platform with two robots that are moved on an omniMove. Alongside such structural assembly applications, we are also actively involved in aircraft engine construction, not to mention a wide range of different welding processes for the space industry. There is no lack of chal-

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allenges here, either. We are currently developing systems for the manufacture of turbine rotors. This is a highly complicated process, as these titanium blades are manufactured using several techniques, including superplastic forming and hot creep forming with arc welding. Other components require (inertia) friction welding. All of these processes are not exactly run-of-the-mill manufacturing techniques, but are required for these special parts.

### **Where is this journey taking us?**

The degree of automation in the aerospace industry is set to soar in the coming years. With the Aerospace Division, KUKA Systems will contribute to this process on several levels: as a major integrator, we can implement complex systems. At the technical level, also, the in-house development of our own end effectors and our expertise in robotic technology make us a highly competent partner. This gives us the ability to offer turnkey solutions as a supplier to the aerospace industry.

