Baumer GigE cameras help to build ultra-modern cruise liners

Ocean cruises used to cater mainly to a wealthy tourist elite, but changing trends have greatly widened their appeal during the past 5 to 10 years. Any vacationer can now enjoy the luxury of a cruise liner such as the brand new Disney cruise liners. To meet the growing demand for sea cruises, shipping companies are ordering ocean liners of ever-increasing size from shipyards. State-of-the-art camera technology is helping to master the challenge of building these ships from the very start of the construction process. At the Meyer Werft yard in Papenburg (Germany), an innovative image-processing system from the Oldenburg company AXIOS 3D® Services, equipped with GigE cameras from Baumer, supports the process of welding steel plates for the cruise ships.

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Increasing complexity

Because of their complexity, cruise ships are designed to be built in individual segments right from the start. Every segment is built separately and is not joined up to the other segments until the end. Individual segments consist of a number of steel plates. The bigger these segments can be made, the more efficiently the ship can be built. Thanks to a specially developed optical measuring system from the company AXIOS 3D® based on Baumer cameras, this process can now be improved. The size of delivered steel plates is limited by their weight, their dimensions and the effort expenditure of transporting them. The first production step in the shipyard therefore consists of welding individual steel plates together into segment panels of the required width.

Baumer TXG camera

Innovative image processing ensures fully automatic alignment

The laser center at the Meyer Werft shipyard in Papenburg contains one of the largest and most modern systems for the automated production of such segment panels. The fully automated system produces these panels from individual steel plates. After delivery to the center, the small steel plates are loaded onto a specially developed transport system. This system is designed to begin by welding the short sides of two plates together. However, they must be mutually aligned before welding can commence. The required position data are supplied by the optical measuring systems CamBar B2 and OPUs from AXIOS 3D® with their integrated Baumer cameras. For this purpose, special, cross-shaped laser markings are previously made in at least two corners of each steel plate. The ultra-modern welding station allows left- and right-hand edge markings to be aligned. The multi-camera system uses cameras before and after the welding station to register all the markings on a particular steel plate. The individual camera systems are connected to the image processing system so that it can deduce the alignment of the steel plates from the detected positions of the individual markings. The image-processing system is integrated into the control of the transport system so that it can align the steel plates. When both plates are optimally aligned to each other, the welding process is started. When the welding process is completed, the resulting larger panel is removed from the welding station by the transport system. Another small plate can then be loaded onto the system and welded to the previously joined plates by the same procedure. This process eventually creates a steel panel of the desired length. To broaden this panel to the required segment width, several narrow plates are produced and subsequently welded on longitudinally at another welding station. The same automatic align-

Ship building at the Meyer Werft yard

ment method is used at this station. Since the composite panels are larger than the small component plates, however, they are susceptible to vibration, sagging and torsion effects which make accurate measurements more difficult. Even when this happens, the required accuracy is ensured by the three-dimensional measurements performed by a stereo camera system. Because of the large detection zone, the system is no longer dependent on the stability of the welding station and is not attached to it, and can therefore deliver reliable measurements.

Camera system meets tough demands

Clear recognition of the markings on the individual steel plates is a key precondition for aligning them correctly. The optical measuring system must fulfill various demands. It must be robust enough to stand up to rugged industrial conditions, yet it should not be too large. To meet these requirements, the Baumer cameras are protected by a special housing which also contains the lighting. Since some of the portals employ up to 4 cameras, the chosen transmission technology must be capable of ensuring reliable multi-camera operation. Gigabit Ethernet offers advantages which make it an ideal solution. This already established camera interface offers the double benefits of a long cable that measures up to 100 meters and a network operation with a simple layout. The image quality must also meet high standards because it finally decides how effectively the algorithm can evaluate the markings. In this respect, a SONY monochrome 1/2" chip with a resolution of 776 x 582 pixels delivers the desired performance. AXIOS 3D® opted for GigE industrial cameras from Baumer at an early stage. Intensive project discussions between AXIOS 3D® and Baumer very soon established the vital importance of the size – along with the high performance – of the cameras. Coupled with the innovative technology offered by Baumer as a leading

Recognition of markings at the welding station

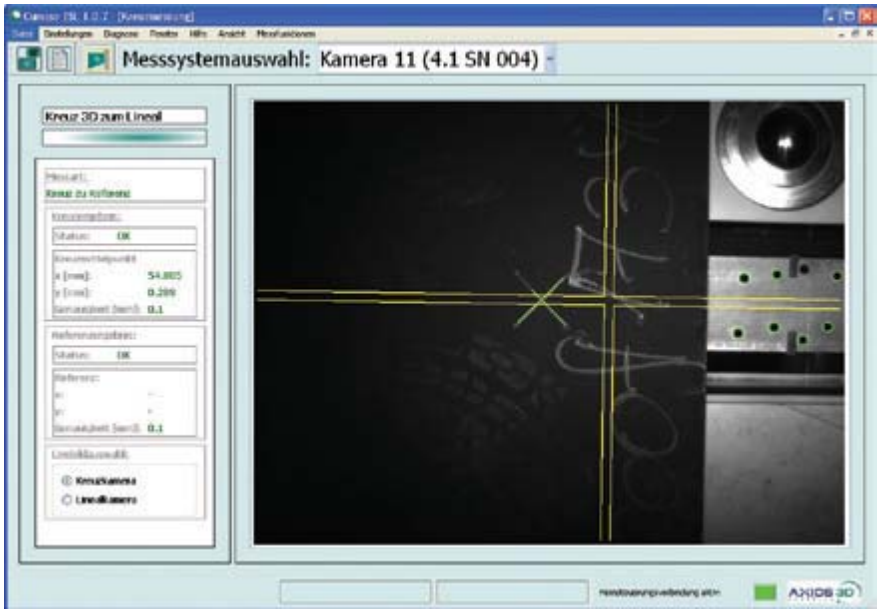
Optical inspection system „OPUs" from AXIOS 3D®

manufacturer of industrial cameras, the high development competence of its Radeberg plant was a convincing argument. This enabled Baumer to develop a special module for the planned application. The space requirement for the cameras was reduced still further and 100% fulfillment of system requirements was achieved.

Clear recognition of markings

After the hardware was defined, the next step called for developing an algorithm

that could cope equally well with changing environmental conditions and a multitude of surface effects on the steel plates. The steel plates can be discolored by various kinds of treatment. But the system must also overcome the influence of simple disturbances like a footprint on a marking. The algorithm of the "CamBar" system, which was specially developed by AXIOS 3D® to recognize markings, can ignore such disturbing effects and reliably locate the position of each marking. The system described here was commissioned at the Meyer Werft shipyard in Papenburg, Germany in December 2009 and enables segment panels for modern cruise liners to be produced more efficiently.



Software for recognition of markings

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