Thanks to its high strength and very light weight, titanium has been widely adopted in many industry areas, and it is now difficult to imagine many processes without it, particularly aircraft construction. However, the advantage of the material – its enormous strength – is exactly what makes processing it so challenging. The titanium heavy-plates up to 100 mm thick must undergo what is called the straightening process as soon as they come out of the furnace, that is, while they are still red-hot. To execute this process, employees need extremely rugged machines, powerful control and drive technology, and a great deal of experience and instinctive feeling because after the straightening run the rollers must be quickly adjusted so that the return run produces a surface evenness of 1 mm over 1 m.

Precise results with seven rollers

To achieve these precise results, the global market leader VSMPO Avisma Corporation, which supplies the world with semifinished products and complex finished parts made of titanium from Yekaterinburg, has replaced an old straightening machine with a model that is able to straighten titanium sheets that are up to 7 m long, 2 m wide, and 60 to 100 mm thick. For this project, VSMPO Avisma chose G+K Umformtechnik GmbH based in Niedernberg, Germany, as its partner. The automation specialist has comprehensive expertise and long years of experience in press technology and metal forming. With the TRS 2000/100 heavy-plate straightening machine, the company realized a custom-made machine concept.

The 480 t colossus is extremely rugged and compact. Its frame consists of four rigid parts connected with each other through prestressed tie rods. The new machine straightens the material by bending it up and down between three straightening rollers each per pass. The straightening system consists of four upper and three lower straightening rollers with a diameter of 700 mm. The rollers are supported on support roll cascades and kept in magazines. This sig-
nificantly simplifies the frequent cleaning and grinding tasks, and the time required for a complete change of the roller set is reduced to one and a half days – compared to up to three weeks with the previous solution.

**Individual instead of central drives**

The simple magazine/roller change significantly increases availability and productivity without changing the actual straightening times in any way. This is possible because the seven straightening rollers are not driven through a rigid, inflexible central drive with a gearbox and a cardan power divider; instead, they are synchronized and driven individually by energy-efficient geared motors and Sinamics S120 frequency converters. Thanks to the modularity of the converter system, the individual drive components can be replaced quickly when service is needed.

This new approach also enables the use of re-ground straightening rollers with different diameters since different circumferential speeds can be easily compensated over the number of revolutions, synchronizing all the rollers in the process. The deviation in height is evened out through a hydraulic spline adjustment system and calculated by a Simatic S7-317-2 PN/DP CPU. This CPU has the required Profinet interface and meets all cycle-time and memory requirements. This allows the operator to concentrate on his or her work and begin the straightening process starting from the basic setting, which needs to be determined only once for a certain sheet gauge/quality. The “recipes” are stored in a Simatic MP377 Multi Panel with a 15” touch display located in the operation console. In order to avoid overloads and thus damage (e.g., through erroneous input) in the mechanism, the torque moments of all the motors are limited through the Sinamics converters. In addition, strain gauges are attached to the machine frame that are monitored by the control system in order to prevent overstretching of the prestressed tie rods.

**Perfectly coordinated total package**

The control units of the Sinamics array are connected to the Simatic control via Profinet. This significantly reduced the wiring and installation effort and allowed both easy dismantling after the preliminary acceptance at G+K and rapid electrical commissioning on-site. “Having the control, drive, and HMI systems from one supplier immediately eliminates problems with interfaces and thus with adjustments,” emphasizes Normen Gröschl, G+K’s managing director responsible for technology. “This is why we decided on a coordinated solution package from Siemens, so we were able to implement all the tasks quickly and without problems.” “The name Siemens has always sounded good to Russian ears,” adds Dr. Michael Kunzel, the managing director in charge of the commercial side.

**INFO AND CONTACT**

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