

Thrifty cutting

Giant Ring Cutter: An innovative cutting process devised by PTZ Weidner cuts resource use tremendously. Company president Andreas Weidner explains how this fast and thrifty saw came into being.

No matter whether cast, rolled or forged – in growth markets like wind power, offshore technology and marine engineering, more and more and ever larger circular elements are needed for use as turret rings, flanges, seals and bearings. In the past, their fabrication was plagued by severe tool wear, enormous energy investments and immense material waste. It was high time to engineer a more efficient process for separating rings from the feedstock. Cutting times reduced by 80 percent, 70 percent less energy use, savings of up to 60 percent in materials and 40 percent in tooling costs. And that is augmented by significantly reduced touch-up effort for cast, rolled and forged rings. All this is achieved by the new Giant Ring Cutter (GRC).

This processing concept, consistently aiming for optimization, derives from the stringent requirements set down in the specifications:

- Extremely fast, high-precision cuts at low heat introduction and with the smallest possible kerf, which means low material consumption
- Maximum parallel planarity, down to a few tenths of a millimeter, at the best possible surface quality
- Great stiffness and precision while machining
- Maximum occupational safety with positive fixing and removal of the rings after separation, together with short, dry chips presenting no accident hazard
- Flexible equipment concept, with the option to retrofit turntable-type lathes and milling machines already on hand
- Automation concept with gripper arm, designed for ring diameters of from four to eight meters, and capacity to carry rings weighing up to twenty tons

The specifications resulted in abandoning the previous cutting implements. Used instead is a circular saw blade integrated into a torsion-resistant machine design, featuring brand-name products made by quality-conscious German and Swiss suppliers. Here roller rail guide systems and ball screw drives made by Rexroth ensure great stiffness and precision.

A prototype machine for the process (patent pending), sized to handle rings of up to 1,450 millimeters in diameter, has been running at full steam since the start of 2011 – and has earned the German Material Efficiency Prize. That's because the Giant Ring Cutter not only slashes fabrication times, but saves an enormous amount of material, too. The new process can separate rings made of stainless steel and other alloys at diameters of up to 9,000 millimeters and wall thicknesses as much as 300 millimeters. Those dimensions are inconceivable with band saws. And the only alternate available to date – oscillating sawing with something like a jigsaw – leaves striations on the ring. These “steps” then have to be cut away, and that means a great waste of material loss and lots of time.

At the greatest precision

With the GRC, the gripper arm first moves the blank onto the cutting device. Three chucking jaws, driven by Rexroth ball screws, hold the ring in position during rotation and make for a clean cut. Rexroth ball screws are extremely accurate since they carry out their advancing, positioning and conveyance tasks with the help of precision spindles and pre-loaded single and double nuts that are free of play. And the stiff Rexroth roller guides, in size 65, reduce vibration enough that noise emissions are just 70 to 74 dB(A), even in the non-encapsulated version. A saw blade, the insertion depth of which is set by way of a roller guide, approaches the rotating blank and begins the separation



procedure. Here only two to four teeth - depending on the material - will be in contact. Thanks to the tangential motion of the two circular paths, the process achieves superb parallel planarity and optimizes the use of the costly material. A further advantage is the low amount of heat developed during the separation process. Exactly defined tooth engagement in the material permits higher cutting speeds without need for cooling lubricants. Thus, in contrast to all other processes, the length and thickness of the swarf can be carefully controlled. The flow of chips is regulated at all times, eliminating operator hazard. At the same time this cutting concept, even in the initial step in production, makes for very smooth surfaces. The cut surface on copper rings is so perfect that it reflects like a mirror. This outstanding process is available in stand-alone machines - either open or encapsulated - and as a retrofit kit for turntable-type lathes and milling equipment. Over and above that, a machine to work tubular and solid material (diameters of up to 480 millimeters and lengths of up to four meters) is in the development stage. Here, again, Rexroth components will ensure precision both in drive mechanisms and in handling. ◀



▲ Three clamping jaws hold the ring as it rotates, making for a clean cut.



▲ The handling unit sets the rings aside, ready for further processing.

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