

Tube Bending & Endforming Technology

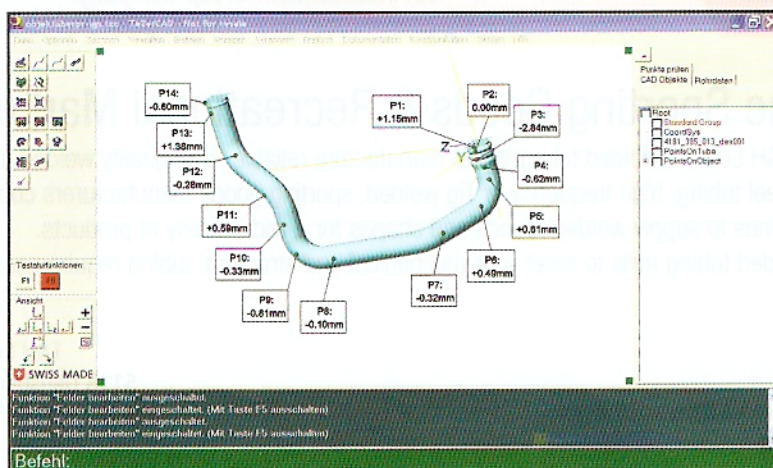
It would be no surprise if an annual review of these specialities produced no surprises. Tube bending and end-forming are mature specialities that have been brought to near-perfection by seasoned professionals who manufacture, and operate, superbly crafted machinery and equipment.

But somehow, in the course of a year's time, there are always developments that make us sit up and take notice. One such was profiled in a recent issue of Design News. New ethernet-compatible Powerlink motion- and machine-control hardware is at the heart of an innovative automatic cell for manufacturing tubular automotive parts. The system controls four axes of motion, contributing to both the rapid development of the cell and its exceptionally small footprint.

The Uni-vercell, by Unison, is droll in name but not in capability. Contributing editor Al Presher, the proprietor of the 'State-of-the-art applications' column, describes it as "packing a complete end-to-end, loading/end-forming/bending and vision inspection process in the space typically required" for a stand-alone tube bender.

The new design also exploits an articulated robot arm to manage all the intervening movements and transfers. The arm eliminates the need for the conventional carriage of a tube-bending machine. It moreover optimizes manufacturing precision by retaining the part for the duration of the process, for additional hardware economies.

Software has become integral to the life of a bender. Tezet's TezetCAD software is used to measure bent tube in combination with a laser probe measuring arm (see page 192)



Modern benders are capable of more than just bending. Apollo's P400 universal multifunction horizontal press can bend, stamp and form (see page 166)

Bending and end-forming are mature specialities brought to near-perfection by seasoned professionals

That does not to begin to exhaust the talents of the Uni-vercell. But one datum sums them up admirably: it can fabricate parts to an overall accuracy of 0.1mm.

This places the newcomer squarely in the distinguished company of the products and services on display in the pages of this section.

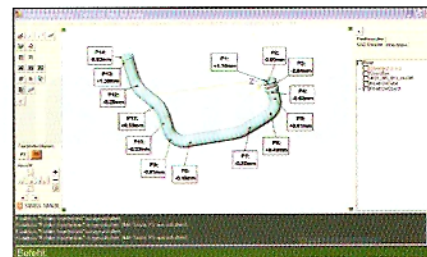


Geometric modules added to TezetCAD capability for measuring bent tube

TeZetCAD is specialized tube software used for measuring bent tube. The software is used in conjunction with a non-contact laser probe for measuring thin and flexible tubes and lines. By using the software with laser probes on measuring arms, it is possible to measure freeform bent tubes. Comparison and correction is then possible according to the criteria of the specific freeform bender.

TeZet, Switzerland, has now introduced the next stage in this software: geometric modules including a user defined dimension. This feature has been added due to the growing need to measure and document all connected parts of a tube, or even those that are in close proximity with a tube.

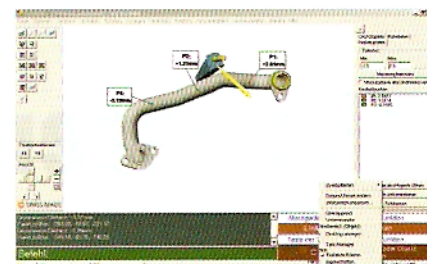
It is often essential to avoid switching between different software during a



TezetCAD is used to measure bent tube in combination with a laser probe measuring arm

measuring procedure. Highly complex CAD systems, in which engineers create the constructions, often do not have the ability to measure parts and generate the necessary tube data output. In such high-end CAD programs the engineers design tubes as two half shells, with data that cannot be forwarded to a bender.

TezetCAD can now measure flanges, the tube angle or the centre of the screw holes. The software is able to generate both the xyz and bending data from the half shells. This is because TeZetCAD has its own 3D IGES interface programmed specially to convert tubes from half shells. This possibility also applies to banjo fittings and hangers.



It is becoming more common for a tube to be measured with connected parts

The self programmed 3D IGES converter initialises with only one click, enabling the algorithm to display the tube on-screen, which is then referred to as the master tube. The 'real' tube from the bender (ie the production tube), can be inspected at certain pre-defined points or even during forming of the tube.

Within the user-defined documentation feature, it is possible to select the document in single xyz points, points on the straight, or points on the exterior of the tube. In addition, it is possible to select the direction as horizontal, vertical or diagonal.

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TUBE STRAIGHTENING AND CUTTING MACHINES

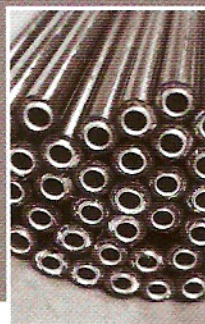
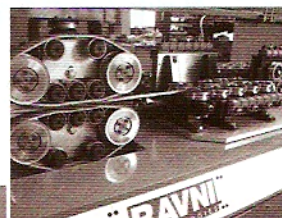
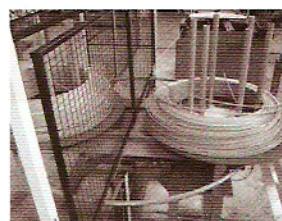
Chipless or slitting saw cut-off machines

Fixed cut or flying cut

1800 parts / per hour !
 (length 1 meter)

1100 parts / per hour !!
 (length 4 meters)

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