Tubes with variable wall thicknesses are a fundamental element of modern lightweight construction concepts. They support the trend to the near-netshape-technology, by using material only in those parts of the component, in which they are necessary with the effect, that those parts of the unit which are only slightly loaded, can be designed lighter as it would be in tubes with a constant wall thickness. This kind of manufacturing process offers the opportunity to reduce the overall weight as well as to enhance the accuracy regarding the tolerances and mechanical properties. Additionally tubes with variable wall thicknesses offer the possibility to lower the components overall costs by reducing excessive material. Until now the most important industrial application of tubes with variable wall thicknesses are hydroformed lightweight frames. In this field of application usually size-rolled welded precision tubes are used. The development of a flexible drawing process by the Salzgitter Mannesmann Precision GmbH offers the opportunity to manufacture cold-drawn tubes according to DIN EN 10305-2 with varying wall thicknesses with the result of a precision tube with tight manufacturing tolerances and a constant outer diameter in combination with a variable inner diameter.

The most important component for this process is a CNC controlled mandrel with different diameter levels which can be moved axially to vary the die clearance. This can be used for hydroforming processes, especially because of the high forming ability as a result of the drawing and annealing processes as well as for power train shafts. In this context the hardening effects of the forming process can be used to adjust the mechanical properties of the tube.

![Fig. 2: Example made of TDT®](image)

Depending on the design a component weight reduction of 20-30% is possible. Another important characteristic is, that the process offers the opportunity to manufacture long tubes as well as short lengths. The low costs for the drawing tool sets (mandrel & die) which are compared to the conventional drawing process only marginally higher makes the process flexible pertaining to individual designs of the TDT®. The main reason is the individual shape of the mandrel. This leads to a high flexibility regarding the lot size and manufacturing options.

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