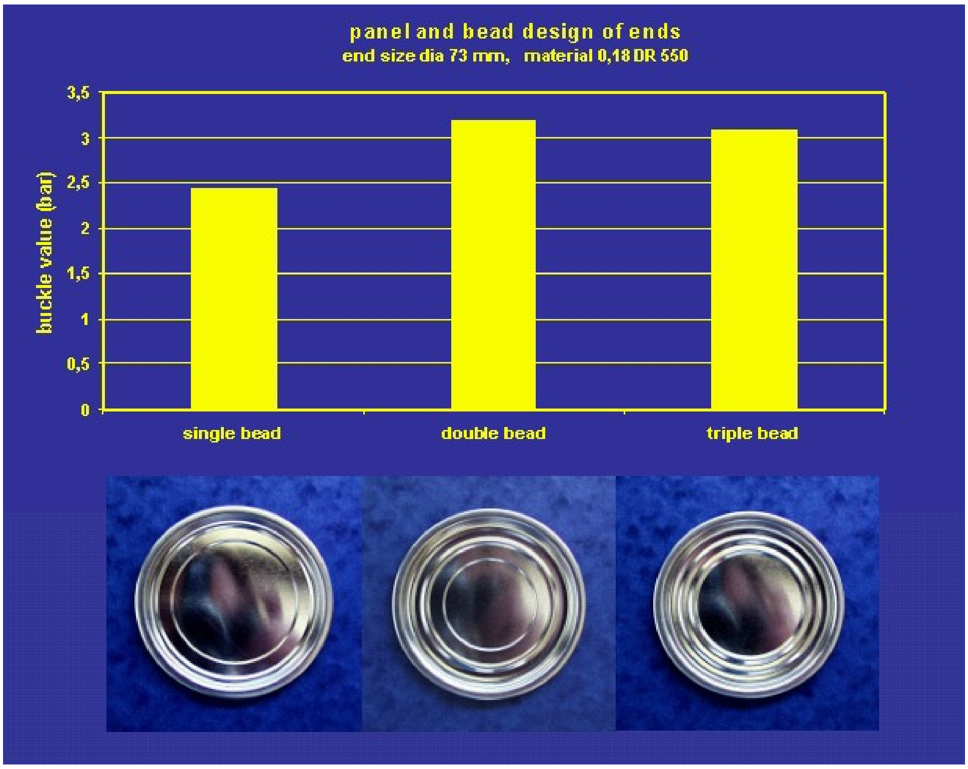
Think thin – for the cans of the future

To contend with tough competition from PET, cardboard and other packaging materials, the canmaking industry is increasingly facing the need firstly to enhance the attractivity of cans, and secondly to reduce production costs.
Following on from the printed cans with eye-catching appearance already dealt with in detail in the last issue, this article is about the cost-reducing potential of lacquered-only or blank cans for simple bulk products.
The reduction of the manufacturing costs for three-piece cans comes mainly from reducing the amount of material used. The tried and tested way to do this has been to steadily reduce the sheet thickness.
This process has made very great advances over the past years. But the potential savings from reducing the sheet thickness for the can bodies is now largely exhausted: in some places, the material thicknesses of the bodies are already so low that the expense of making and handling these bodies without damaging them sometimes cancels out the savings on material. Sheet thickness reduction for the top and bottom ends however still seems to have major potential.
Downgauging of the end is pursued with the aim of making considerable savings by reducing the use of material. On the other hand, it must be ensured that the strength of the end remains sufficiently high for processing. The key value for this is the buckle value, or peak strength, and the panel distension under internal pressure and its reversion when the pressure is relieved (PNR value).
The strength of the seamed end is influenced by:

- the basic strength of the sheet used for the end
- the end geometry and its method of manufacture
- the quality of the double seam.

All three influencing parameters are interdependent. If one of the three parameters fails, the entire system fails.
1. Influence of material: The main factor in the material is – apart from sheet thickness – its tensile strength, and linked to this its hardness. The higher the tensile strength of the material, the stronger the seamed end with the given geometry and material thickness, and also the more difficult it is to manufacture perfectly.



2. End design: Both the end geometry itself and the manufacture of this end geometry as dictated by the press and by the tooling are important.
2.1 End geometry: The countersink depth, the countersink radius and the geometry of the first bead are of major importance, as it is these that mainly determine the buckle value. The influence of the inner beads is less, but they cannot be dispensed with. They affect the panel distension.

2.2 End manufacture: When making the ends, it is important that the material is not stretched in the beads, in the countersink inclination or in the countersink depth. This preserves the material strength and prevents damage to the tin and lacquer coatings. This is achieved by the clamping and blank holder forces not increasing in the END-O-MAT multi-die tools during closing of the tool. In addition, a Cantec 2-stage tool – where the end panel is first completely shaped and only then is the countersink depth drawn in the 2nd stage – has an advantageous effect. This allows large countersink depths to be drawn without the occurrence of harmful material stretching in the countersink and panel area, and ends from material of any tensile strength and hardness are absolutely flat. With this type of manufacture, material thinning in DR sheets has practically no importance. Ends made using these rules revealed for example in the case of a 73 mm end and 0.16 mm DR 550 material a buckle value of up to 2,7 bars, and in the case of a 99 mm end and 0.20 DR 620 material a buckle value of more than 2,0 bars.

3. Double seam and countersink depth: The quality and consistency of the double seam too have in the final analysis a considerable effect on the stability of the can end. The end usually fails where the seam has its weakest point. To achieve a good seam quality with thinner and harder sheets, it is essential to reduce the seam geometries. As described in SEFEL No. 1, the so-called miniseam (SEFEL seam type 0III) is obtained.
On the other hand, a small seam also somewhat weakens the end stability again. The aim is therefore to have the largest possible seam that can still be made perfectly with the given material quality (e.g. SEFEL seam type 0II or 0I).
The countersink depth of the seamed end is at least as important.
When the maximum possible seam size and countersink depth are taken into consideration, the dimension of the cut edge is not decisively reduced. The saving comes from the decrease in the amount of material stemming from the reduction of the sheet thickness.

The above shows that it is possible, by taking into account all the influencing factors, to achieve downgauging of the end without any loss of stability or lowering of the failure limits. It also indicates however that downgauging is somewhat harder for the end than for the body, since strength, manufacturability and seamability need to be taken more into account. On the other hand, the machines, processes and skills are now available – as indicated – to achieve this cost reduction process in a holistic approach.
Only overall competency in stamping, curling and seaming will lead to success here.