Neck reforming

Re-forming of the necked shoulders of can bodies with stacking necks to increase their crush resistance

Problem

Material savings dictated by the necessity to reduce costs have resulted in ever thinner sheet gauges. To compensate the reduced crush resistance of the cans, at least partially, materials with a higher strength (usually in conjunction with limited elongation) have come to be used.

When die-necking the bodies, the higher yield stress required to shape the neck is achieved with modified tool geometries with smaller drawing radii and/or larger necking angles.The resulting neck geometry, however, impairs the crush resistance of the cans.
Beaded cans with stacking necks are often crushed at the neck under axial load while the beaded sections are still sufficiently resistant.

The conflict we are facing here is that geometries enhancing the crush resistance can only be formed within certain limits (or not at all), while the targeted crush resistance cannot be obtained with the geometries which would be optimal from a process-related, technical point of view.
This conflict becomes even more pronounced when dealing with reduced sheet gauges, harder materials and side welds protected by powder lacquer.

Solution

In spite of a long series of tests with necking tools with various geometries it has not yet been possible to produce a necking shoulder with sufficient crush resistance in a single operation.
The only solution is to reduce the diameter first with a geometry which is be optimal from a process-related, technical point of view and to re-form the necking shoulder afterwards to achieve the necessary crush resistance.

CAN-O-MAT

Recent studies have now confirmed that the geometry of the necking shoulders can be re-formed after necking and that the crush resistance of necked cans can thus be increased.

This involves 2 operations:

1. Diameter reduction using a tool geometry which has been optimised to meet process-related, technical requirements so that the material becomes sufficiently elastic to flow around the necking shoulder without wrinkles.

2. Re-forming of the necking shoulder without modification of the neck diameter (in particular reduction of the angle of the shoulder) to increase its crush resistance.

The re-formed necking angle is independent of the necking angle of the first process operation. For bodies for can size 73/70 x 112 mm (sheet gauge 0.12 mm, DR550 material), the optimum re-formed necking angle was 21°, regardless whether the necking angle had been 27° or 30° at

the first stage. The necking angle of the first stage can thus be optimised to meet process-related, technical requirements.

Subsequent re-forming of the necking shoulder is always recommended when the required crush resistance could not be achieved with the first process operation.

The enclosed diagram summarises the crush resistance figures measured on bodies for can size 73/70 x 112 mm with one-step neck and with subsequently re-formed necking shoulders. For bodies made from SR material, with appropriately thick sheet gauges, a necking angle of 21° is still sufficient. DR material with sheet gauges down to 0.13 mm requires a necking angle of 27°, or 30°, if the sheet gauge is reduced even further, in conjunction with a diametrically opposed reduction in crush resistance. Here, calibrating the necking shoulder to 21° can increase the crush resistance by approx. 12 to 18 %, as compared to a necking angle of 30°.

Neck reforming:

Process to increase the axial load with a second die necker