INFLUENCE OF FORGING TEMPERATURE ON SOLID LUBRICANTS BEHAVIOUR IN COLD FORGING

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INDUSTRIAL & SCIENTIFIC PROBLEM

Cold forging operations are characterized by high pressures at the interface between tools and workpiece (up to 3.000 N/mm²);

High deformation provokes increments in the temperature up to 450 ° C;

The concurrence of high pressures and high temperatures influence the workpiece material properties and the lubricant viscosity due to the high tribological loads.

WHY USE LUBRICANT?

The lubricants used in cold forging withstand the interface conditions encountered in production;

Simplify subsequent operations of degreasing and painting of the finished product.

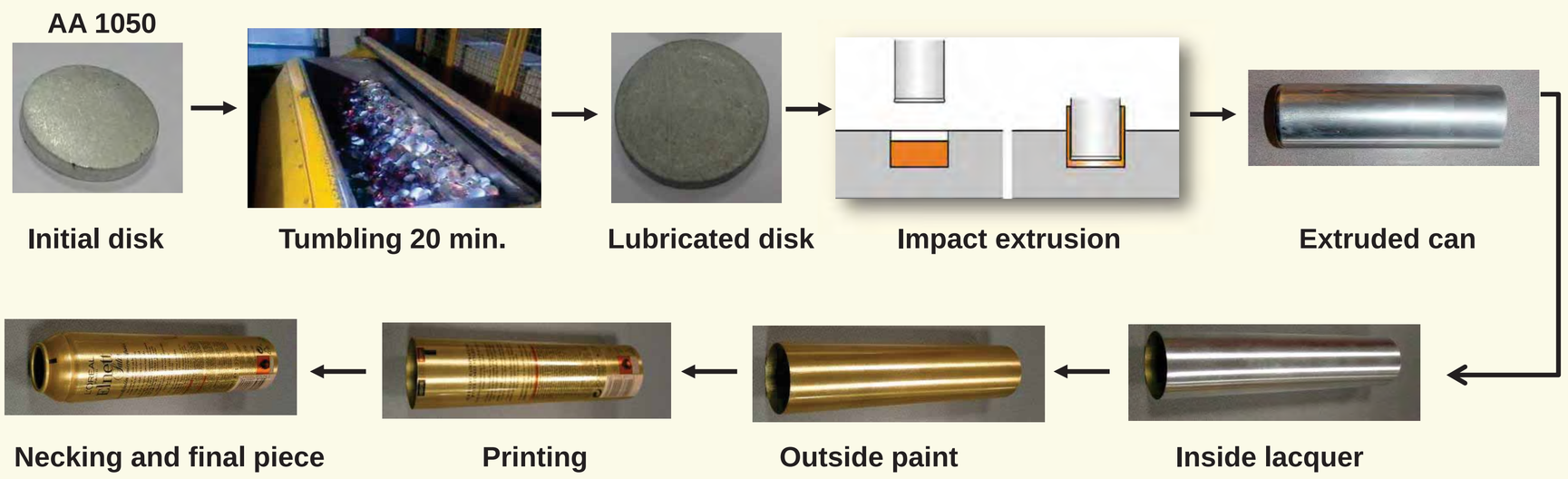
TARGET OF THE PROJECT

Investigation the friction behaviour of new environmental-friendly solid lubricants under process conditions, with particular attention to the dies temperature parameter;

- Development of standard procedures to specify the design of a die setup;
- Development of a standard procedure for the evaluation of lubricants on active die components.

PROJECT STEPS

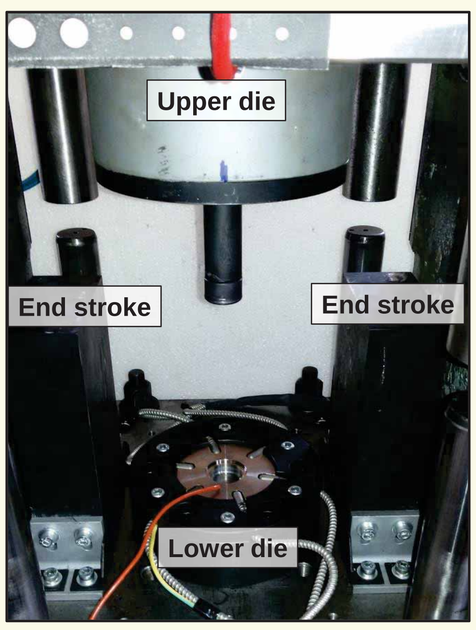
Industrial case: complete process of cans manufacturing

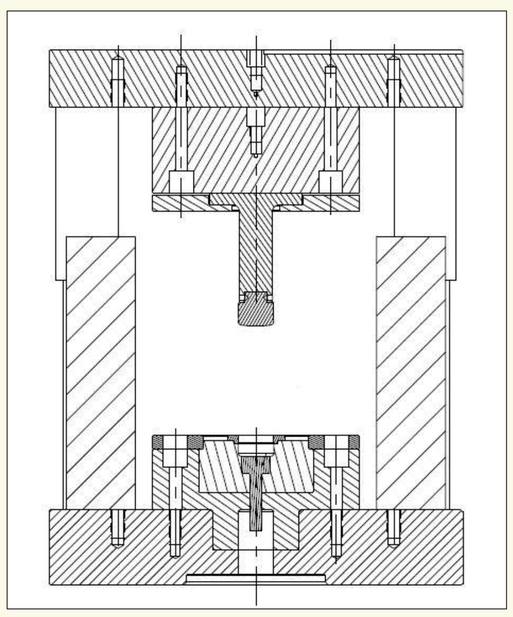


Concept and design of testing dies

Design of :

An experimental apparatus in order to reproduce controlled variation of the surface expansion and the tool temperature in the range 20-150 ° C with the goal to investigate extrusion force during the test.





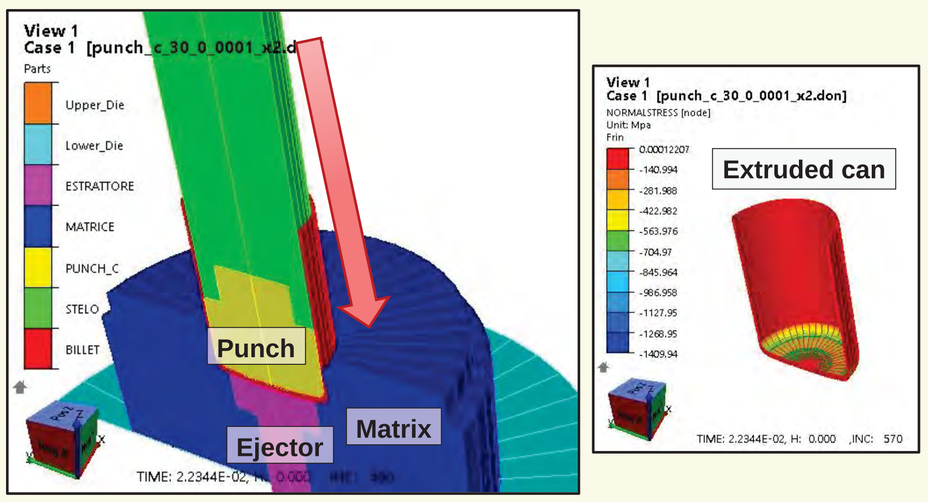
Identification of friction coefficient by inverse analysis using FORGE™

Purpose:

A real industrial process is simulated in order to predict the stresses applied on die and the process parameters;

A numerical inverse analysis was carried out to calculate the friction coefficients as function of the process parameters;

The difference between experimental and numerical values of the extrusion forces was selected as the objective function to be minimized, choosing the friction factor *m* according to the Tresca model, as the main parameter governing the convergence.

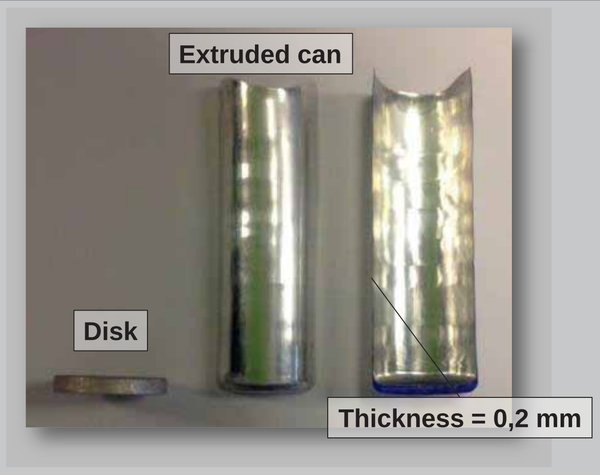


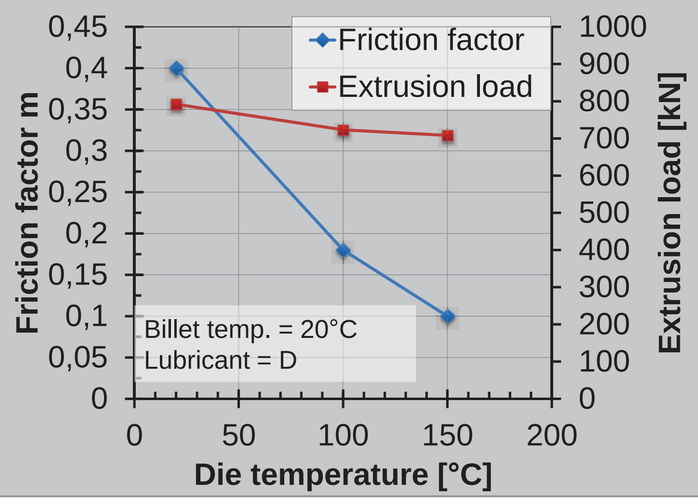
Results

Extrusion load for the AA1050 discs lubricated with solid lubricant at different temperatures was precisely predicted;

The effects of the temperature on the lubricants stability was analyzed;

The tool-workpiece friction factor was determined for different expansion ratios and temperatures.





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