TRAINING-ID: 2000-L1-03
Basics of HFQ - Hot Forming and Quenching of Aluminum Alloys (2 days)

DESCRIPTION
Aluminum is a preferred choice material for reduction of weight of automotive vehicle to satisfy the stringent CO2-emission standard. Because of this up to 15 % growth is predicted till 2025 in usage of aluminum sheet. A strong competition in the Aluminum industry has now started to capture the aluminum sheet market growth by targeting production of high-quality aluminum sheet.

Light weighting by aluminum in manufacturing of non-structural parts like inner and outer panels by cold forming are already practiced by OEM's. However, for structural parts like B-Pillar, A-pillar, C-pillar, cross beam and impact beam requires high strength aluminum alloys. But the high strength aluminum alloys are not formable at room temperature. Therefore, requires another forming approach.

AUDIENCE
Engineers and technicians in the fields of production, process, tooling, material testing and QM & QS.

PREREQUISITES
Understanding in heat treatment and hot forming and quenching.

BENEFITS
The overall performance and the variety of methods of the seminar are designed most helpful for efficient studying. You will have the opportunity to experiment with various parameters and experience hot forming and quenching in the field of aluminum and acquire a deep insight into the most efficient skills in technology.

METHODS
Digicon Academy provides a focused, practically and economically oriented knowledge transfer in the form of seminar lectures and field tests on samples. The involved trainers are highly qualified and experienced key players.

CONTENT
Hot forming and quenching of aluminum similar to press hardening of steel is a newly developed forming technology that is able to form complex shape structural parts made from high strength aluminum alloys (Fig. 1). In this processing technology, aluminum sheet is solution heat treated between 450-580°C for 0-10 min in a furnace. Thereafter it is transferred into the press. During transfer, the aluminum blanks cools. During pressing, it acquires the shape and necessary quenching. The formed and quenched parts artificially aged to T6 condition. Improvement in formability due to elevated temperature of high strength aluminum facilitates forming of complex shape parts which are not possible by cold forming. The major advantages of the hot forming and quenching process are follows:

- The reduction of the number of individual steps means there are fewer opportunities for contamination of the metal within each process, and uncontrolled air-cooling.
- Less energy is needed due to the reduction in the number of times the material is reheated.
- The formability of the material is higher, due to the hardening stages being performed during or after the forming stage.
- Spring back can also be reduced by the combination of quenching and forming stages. This, in turn, increases the geometrical tolerances of the component, allowing components to be assembled easily.
- Distortion of the component is also limited due to the quenching stage being contained in the cold die.
- The time of production for each component is reduced, because the component no longer has to be transferred between as many different items of process equipment. This consequently leads to financial savings.

T1: Introduction and fundamentals in HFQ

- Recapitulation Process fundamentals
- Which quality characteristics have to be fulfilled? - Critical quenching rate, Interface between tool/press/cooling, Thermal expansion, Form- ability, etc...
- Product design, most important process parameters, tool concepts, thermal treatment

T2: Process Parameters for Tools

- Cooling approaches, handling of problem areas
- Segmented construction
- Tool design
- Failure possibilities (drawing clearance, wear, blank holder, positioning ejector, etc.)
- Failure criteria by replica or drawing clearance measuring
- Process control

T3: Virtual Engineering

- From the component geometry to the tool
- Interface definition and using software
- How the product geometry has to be? Are there possibilities for optimization? What is not?
- Active surface construction
- Blank shape
- Simulation
- CAD (Catia)
- Trimming

T4: Tool Materials and Coatings

- Hot forming tool steel (mechanical and thermal properties)
- Tool coating
- Recent developments

T5: Practical Examples

- Case Studies

P1: Practical Examples

- Case Studies in the laboratory at the furnace

Summarization

- Summary of the training
- FAQ
- Feedback

ALUMINUM

TRAINING