Heat treatment of aluminium alloyed parts – addressing diverse challenges

Aluminium demand in the fields of automotive engineering, aerospace, transport and construction is forecast to grow. [1, 2]
In these industries, compliance with relevant standards (e.g., AMS, CQI-9) is essential, raising requirements on the heat treatment of castings and forgings. To fulfil these standards, custom solutions – i.e., processes tailored individually to the product to be annealed – are becoming increasingly important. At the same time, resource conservation, process reliability, automation and equipment availability play a major role.

Addressing these challenges, Otto Junker offers various equipment types for heat treatment of aluminium alloyed parts. Such heat treatment lines consist of a solution annealing furnace, a cooling system adapted to the annealed product, and an artificial ageing furnace. For energy saving purposes, hot flue gas from the solution annealing process is injected into the artificial ageing furnace. If the amount of waste heat is insufficient, a so-called ‘booster’ supplies additional heating capacity to ensure the reliability of the process.

The innovative solution – e.g., for the automotive industry – is a heat treatment system (e.g., for wheels) based on walking beam technology. Otto Junker has installed several of these systems to date. The wheels pass through the furnace on a walking beam conveyor, which offers significant advantages over traditional conveyor concepts (such as roller hearths). First, it eliminates the need for product carriers and thus saves the energy needed to heat up such ‘dead weight’. The walking beam concept is also capable of handling different wheel sizes while providing highly accurate positioning without relative movements.
Items that cannot be moved individually by the walking beam (e.g., slugs), or product not expected to meet particularly exacting standards, or highly sensitive parts posing particularly exacting requirements, for instance regarding touch-free conveyance, are placed in a basket or on a purpose-built product carrier and passed through the line on a roller conveyor. Although in this plant type the basket must travel through the system as a ‘dead load’, it is necessary to find the proper equipment variant (walking beam or basket conveyor) for each given application case and customer specification.

Particularly high demands in terms of short cool-down times are placed on parts in the aerospace industry. Here, Otto Junker uses a thermoprocessing line that provides particularly high temperature uniformity and minimum quenching times. Again, a separate ageing furnace can be added to the solution annealing furnace and the cooling system.
All equipment types/versions are low maintenance and user-friendly and provide high availability rates.

Progressively more exacting application requirements also drive improvements and new development in heat treatment. Therefore, Otto Junker provides facilities for carrying out industrial-scale trials in conjunction with experienced engineers at its in-house Technology Centre.