SIEMENS

Process Analytics

Gas analysis during the thermal treatment of workpieces

Maximum performance in all measuring ranges

Industrial gases are indispensable during the thermal treatment of metallic workpieces to optimize the material properties and the workpiece surfaces.

Of central importance is the ambient atmosphere. The requirements regarding monitoring and regulation of the stipulated composition are precisely satisfied by gas analyzers.

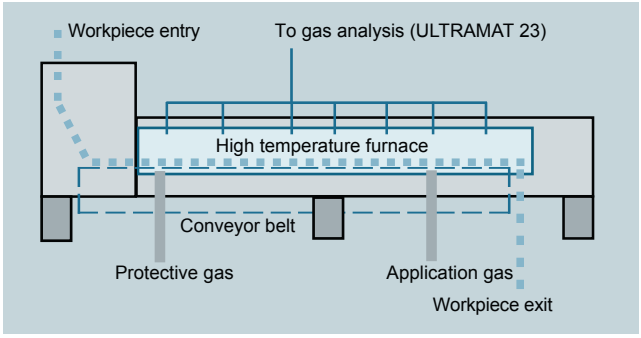

Fig. 1: Continuous furnace for thermal treatment

Requirements

In order to achieve optimum results during thermal treatment, it is necessary to continuously check the chemical composition of the atmosphere in which the processes are executed (fig. 1).

On the one hand, these are processes in industrial furnaces where the surface oxidation by O_2, CO_2 or H_2S has to be prevented while the thermal treatment has to achieve a specific crystalline structure (tempering, annealing). This is achieved by means of a controlled neutral gas atmosphere.

On the other hand, during these processes the surface has to be specifically influenced with respect to hardness and adhesion (e.g. for paints) using of an exactly defined atmosphere during the thermal treatment.

Procedures for thermal treatment

Procedures for thermal treatment are carbonizing, decarbonizing and carbonitriding.

When carbonizing, the surface of steel parts is enriched with carbon at high temperatures. Carbonizing furnaces work with a mixture of nitrogen and methanol. By contrast, decarbonizing reduces the hardness by removing carbon from the workpiece surface.
A further procedure is carbonitriding. In this case, nitrogen is added to the surfaces in addition to the carbon, resulting in a particularly high degree of hardness. Ammonia (NH_3) is therefore the additional component in the furnace atmosphere.

Alongside the gases mentioned, methane (CH_4) also has an influence on the process (fig. 2). Hence measurement of CH_4 is also important.

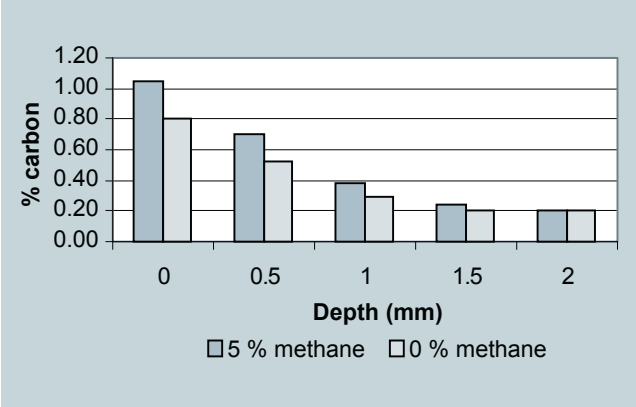

Fig. 2: Influence of methane concentration on carbonizing

Technical solution

During thermal treatment it is decisive to select the gas compositions precisely and to monitor them exactly. The ULTRAMAT 23 multi-component gas analyzer (fig. 3) permits measurement of the CO, CO_2 and CH_4 concentrations in one device. The analyzer uses a non-dispersive infrared sensor (NDIR) which guarantees high selectivity and measuring accuracy. Relay control together with automatic maintenance and remote diagnostics functions facilitate the integration of the ULTRAMAT 23 in a wide variety of automation concepts.

Advantages at a glance

- Economic efficiency, reliability, product quality, and system concept
- High efficiency thanks to analysis of different gas components using only one analyzer
- Minimum consumption of calibration gas
- Low maintenance overhead
- Cost savings through precise control of the used gases
- Insensitive to external interferences thanks to multilayer detector and autocalibration
- Significant reduction in workpiece rejects

Fig. 3: ULTRAMAT 23

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