

## WHAT IS MP35N?

MP35N<sup>®</sup> is a vacuum induction, vacuum arc re-melted alloy based on the quaternary of cobalt, nickel, chromium and molybdenum that has shown an unusually favorable combination of high strength and corrosion resistance. This alloy, MP35N<sup>®</sup>, and the family of composition from which it was derived, MULTIPHASE<sup>®</sup> Alloys, were originally developed by E.I. Dupont de Nove's & Company and patented under U.S. Patent Nos. 3,356,542 and 3,562,024 with other pending U.S. and foreign patents. The rights to this alloy system were acquired by SPS Technologies in 1967 and Latrobe Steel Company was subsequently licensed to manufacture the MULTIPHASE Alloys.

The nominal composition of MP35N alloy is 35% Ni, 35% Co, 20% Cr and 10% Mo. The alloy can be work strengthened to ultimate tensile strength levels in excess of 260,000 p.s.i. (1793 MPa) with good ductility – 40% reduction in area. Annealed MP35N alloy has a tensile strength of 135,000 p.s.i. (931 MPa), a yield strength of 60,000 p.s.i. (414 MPa), 68% elongation and 75% reduction in area.

In the annealed condition, MP35N alloy is a typical face centered cubic material similar to many nickel-based alloys. This structure is unstable at temperatures below 1200°F (649°C), but it persists at room temperature and below because transformation to hexagonal-close packed phase is sluggish and, unlike the formation of martensite in steel, does not occur at a definite temperature. Transformation is induced, however, by straining, the amount of transformed product being a function of the temperature of working and the amount of reduction.

To obtain high strength the alloy can be extruded, rolled, swaged, drawn or worked by a combination of these processes. Working operations which deform the metal in a similar manner can be considered additive when determining the strength that a given part will eventually develop. Thus, all of the work strengthening does not have to take place at the mill; a portion can be added when a part is formed into its final shape.