Haskel Boosters in Laser Cutting

Theory of Laser Cutting

When laser light impinges on a solid target, it is either reflected, absorbed or transmitted according to the incident energy density, duration, wave length and the physical properties of the material to be processed. If the power density is low, the light that is absorbed appears as heat which is slowly distributed throughout the materials by thermal diffusion. This leads to the absorption of energy at just below the surface level. At higher power densities, intense local heating of the surface will occur and the reflectivity will fall to perhaps half its normal value.

Under these conditions, the heat cannot be conducted away quickly enough to prevent the surface temperature reaching melting point and forming a molten pool. A further increase in power density will cause the surface temperature of the molten pool to reach boiling point and vaporization will occur. This will happen when the energy dissipated is approximately equal to the latent heat of sublimation. The molten material is removed by gravity, or by a jet of assist gas.

Assist Gases

Used for process enhancement at the point of use (i.e., produce a clean cut), the boosting of Assist Gases is where the Haskel Booster application exists.

Oxygen, Argon, Helium and Nitrogen are common Assist Gases. However, only the latter gives us opportunities for our booster.

Oxygen, for example, is commonly used at pressures between 4 to 6 bar for cutting Mild Steel and this supply can be met from either a gas or liquid bulk storage supply.

Nitrogen is used at pressures between 20-25 bar (295-370 psi) for cutting stainless steel as it prevents burning and cools the top edge. The volume of gas used is in the order of 18-20 scfm.

Bottled gas can therefore be used up very quickly and can work out costly. However, by purchasing liquid Nitrogen in bulk storage and then boosting the "boil off" gas pressure (of about 12-15 bar or 175-22.0 psi) to the pressure at the "point of use" (20-25 bar or 295-370 psi), substantial cost savings can be made.

The user can very quickly pay back the cost of the booster system. Typical savings amount to $1/minute operation or $400 per 8 hour day and is dependent on the throughput.

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