Precision laser/robot cutting

Developments in laser technology and fiber optic beam delivery have helped the Nd:YAG laser win a reputation as a viable, economic alternative in some cutting applications.

Tim Morris

The application of robotic laser cutting systems has grown dramatically in recent years. This can be attributed to several key factors:

- Development of fiber optic beam delivery for Nd:YAG lasers
- General acceptance of laser processing in industrial environments
- Introduction of higher-powered Nd:YAG lasers increasing the cutting speeds and thickness range
- Advancements in peripheral equipment for cutting applications
- Realization of the economic benefits of flexible automation for small batch processing

Precision cutting as discussed here is defined as cutting on a finished product that requires no further processing on the cut edge to meet its intended function. These precision cuts can range from small shapes to large three-dimensional contour trimming operations. Robotic Nd:YAG laser cutting can provide minimum repeatabilities of ± 0.010 in. and, in some cases, minimum repeatabilities as good as ± 0.002 in. can be achieved. These cuts are typically cross free with side wall bevel angles of less than one degree.

This process has attained a reputation of being a reliable and safe industrial method as more and more lasers have been incorporated in the manufacturing environment. As industry becomes more educated and understands the easily manageable safety requirements, the process will become increasingly accepted.

Although the vast majority of industrial laser cutting applications utilize CO₂ lasers, the Nd:YAG laser has virtually taken over the robotic cutting market. The fiber optic beam delivery of Nd:YAG lasers is much more user friendly when compared to maintaining alignment in the hard optic beam delivery systems that are required for CO₂ lasers. This factor, in addition to the recent increase in available power levels, makes the Nd:YAG laser the laser of choice. It should be noted that CO₂ lasers are still an attractive method for some nonmetallic cutting applications (such as textiles and plastics), where the longer CO₂ wavelength is more efficient or where power levels above 3 kW are required.

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