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Using optical pyrometer in gas assisted laser cutting of steel sheets

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The use of optical methods of nondestructive testing can permit the real time control of gas assisted laser cutting, which is especially important in cutting metal sheets of large thickness and in other cases when the specified laser power is limited by laser operation modes[1,2].

Optical pyrometry presents the most convenient technique for monitoring the cutting parameters in terms of luminosity of the heated kerf zone[3,4]. The experimental results of pyrometric measurements in gas assisted laser cutting of carbon steel sheets are discussed in the paper. The experimental setup employs the machine for laser cutting with CO_2 laser of 1500 W power. The method of optical pyrometer is used with optical waveguide system. The variation of luminosity of melting kern in zone of laser irradiance influence on steel plate in gas assisted laser cutting is coupled with variation of laser cutting condition parameters. The experiments have proved the possibility of the real time control of gas assisted laser cutting efficiency through using the pyrometric techniques. The results could be used in expert system database[5]. At the same time, the signal is not only dependent on the temperature of the surface in the heat affected zone. It is determined by other factors, for example, the size of the surface heated to maximum temperature, the directional luminosity diagram of the heated surface, the distance from the luminosity area to the optical sensor, the sensor location relative to the kerf zone. Some of these factors can concern with laser cutting efficiency, but it is required that special algorithms and schemes of optical information processing be developed in order to separate the cutting quality factors from the other ones[6].

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