

Abstract Submitted
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Measurement of plasma properties in a cutting arc JOHN PETERS, JOACHIM HEBERLEIN, University of Minnesota, JON LINDSAY, Hypertherm Inc. — Plasma cutting utilizes a highly constricted arc to melt the material being processed. The processed material, or work-piece, serves as the anode, and arc constriction between the torch cathode and anode is attained using a small diameter nozzle together with a high velocity gas flow. This gas flow also assists in the cutting process by removing the molten material from the work-piece. The performance of the cutting system is related to the properties of the plasma jet. Temperature, electron density and the velocity of the jet are the properties used to characterize the plasma arc. Spectroscopic methods are used to measure radial and axial distributions of the temperature and electron density within the arc using several calculation methods as well as several emitting species. From these measurements the axial pressure variations due to the expansion of the under-expanded plasma jet are estimated. The validity of the assumption of LTE in different regions of the arc is also discussed. Finally, the effects of selected cutting process inputs such as current, flow rate and nozzle diameter on the plasma jet properties are evaluated.

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