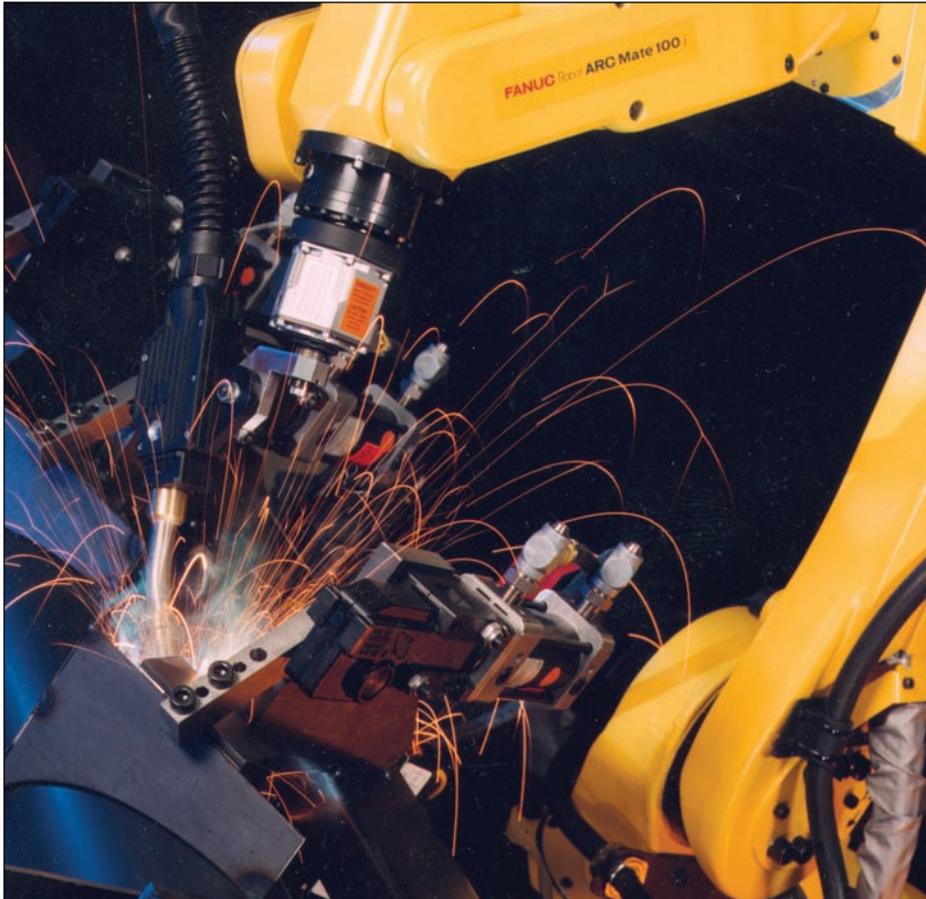


MECHANIZED, AUTOMATED, AND ROBOTIC WELDING



Photograph courtesy of Fanuc, Incorporated

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CHAPTER 11

MECHANIZED, AUTOMATED, AND ROBOTIC WELDING

INTRODUCTION

The methods of applying the various welding processes are categorized according to the degree of operator involvement in the performance of welding operations. In manual welding, defined in the American National Standard *Standard Welding Terms and Definitions*, AWS A3.0:2001, as “welding with a torch, gun, or electrode holder held and manipulated by hand,”^{1, 2} the welder performs the welding function and maintains continuous control of the welding operations by hand. In semiautomatic welding, defined as “manual welding with equipment that automatically controls one or more of the welding conditions,”³ the welder manipulates the welding gun to create the weld while the electrode is automatically fed to the arc.

In mechanized welding, defined as “welding with equipment that requires manual adjustment of the equipment controls in response to visual observation of the welding, with a torch, gun, or electrode holder held by a mechanical device,”⁴ the welder’s intervention consists of adjusting the equipment controls in response to visual observation of operations.

In automated welding, defined as “welding with equipment that requires only occasional or no observation of the weld, and no manual adjustment of the equipment controls,”⁵ the welder’s involvement is limited to activating the machine to initiate the welding cycle and observing the weld on an intermittent basis, if at all.

Robotic welding, defined as “welding that is performed and controlled by robotic equipment,”⁶ entails no involvement on the part of the welding operator in performing the weld, as the welding operations are carried out and controlled by welding robots.

In both automated and robotic welding, however, the operator plays an active role in quality control through the identification of the presence of weld discontinuities. When discontinuities are encountered, appropriate measures must be taken on the part of maintenance or programming personnel to correct deviations.

Adaptive control welding is defined as “welding with a process control system that automatically determines changes in welding conditions and directs the equipment to take appropriate action.”⁷ This process application relies on sensors to provide real-time data regarding abnormalities to the computer controller. The controller then makes the necessary changes in welding parameters to produce quality welds. Thus, welding is performed and controlled without operator intervention or supervision.

Figure 11.1 summarizes the capabilities of the different welding application methods.

1. American Welding Society (AWS) Committee on Definitions, 2001, *Standard Welding Terms and Definitions*, AWS A3.0:2001, Miami, American Welding Society, pp. 50–51.

2. At the time of the preparation of this chapter, the referenced codes and other standards were valid. If a code or other standard is cited without a date of publication, it is understood that the latest edition of the document referred to applies. If a code or other standard is cited with the date of publication, the citation refers to that edition only, and it is understood that any future revisions or amendments to the code or standard are not included; however, as codes and standards undergo frequent revision, the reader is encouraged to consult the most recent edition.

3. American Welding Society (AWS) Committee on Definitions, 2001, *Standard Welding Terms and Definitions*, AWS A3.0:2001, Miami, American Welding Society, p. 67.

4. American Welding Society (AWS) Committee on Definitions, 2001, *Standard Welding Terms and Definitions*, AWS A3.0:2001, Miami, American Welding Society, p. 51.

5. American Welding Society (AWS) Committee on Definitions, 2001, *Standard Welding Terms and Definitions*, AWS A3.0:2001, Miami, American Welding Society, p. 13.

6. American Welding Society (AWS) Committee on Definitions, 2001, *Standard Welding Terms and Definitions*, AWS A3.0:2001, Miami, American Welding Society, p. 64.

7. American Welding Society (AWS) Committee on Definitions, 2001, *Standard Welding Terms and Definitions*, AWS A3.0:2001, Miami, American Welding Society, p. 11.