

# Development of PC Program for Arc Welding Quality Determination

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**Abstract.** In this study, we developed PC software and the monitoring system to evaluate welding quality by measuring the Arc welding voltage and current. The developed program converted the measured value of the voltage, current, and gas into graphs and displayed them to users. In addition, the program was composed of a set of components to check the status of the welding changes. When abnormal welding occurred, the program outputted a red rectangle box to show an error. As a result of the repeated experiments of normal and abnormal welding, we could successfully confirm welding quality.

**Keywords;** Arc welding; welding quality discrimination; PC program development

## I. Introduction

Arc welding is a welding technique which generates the intense heat needed for joining metals in an automotive parts industry [1-3]. Depending upon quality and thickness of the metal, an appropriate voltage and current need to be approved. While the stable voltage and current can be expected during normal welding, bigger values than the pre-established welding voltage and current temporarily occur sequentially when welding is unstable [4][5]. Hence, it is possible to correctly identify a welding status through analysis of the welding voltage and current in real time [4-7]. We measured the Arc welding voltage and current using a voltage sensor and hall sensor and developed PC software and the system to evaluate welding quality using such changes.

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## II. System deSign and Method

As the basic system architecture is depicted in Fig. 1 below, voltage and current sensors are mounted to analyze the voltage and current of Arc welding. To check gas flow, a flow sensor is also connected. CARLI Electronics' MX40 and the hall sensor are used to measure the voltage and current, respectively. The maximum  $\pm 15V$  current is outputted through the hall sensor, and the voltage is reduced to suit the ADC input voltage.

Fig. 2 below displays the results of welding monitoring in PC software. The measured value of the voltage, current, and gas is converted into graphs during the welding process. The developed program enables users to set up the product model number, name, and the number of welding jig. External communication devices such as RS232, TCP/IP, Wifi, SD card, etc. are connected to the welding monitoring system, and monitoring channels are established by the number of the connected welding jig. In addition, the extra alarm function is added to inform the status of normal and abnormal welding. All the history information, i.e. number, model, working hours, etc., is stored in a database, and it is possible to analyze and manage the welding status using the stored data.

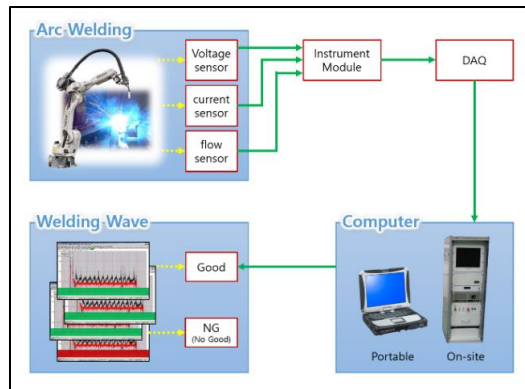


Fig. 1 Basic configuration diagram of welding monitoring system

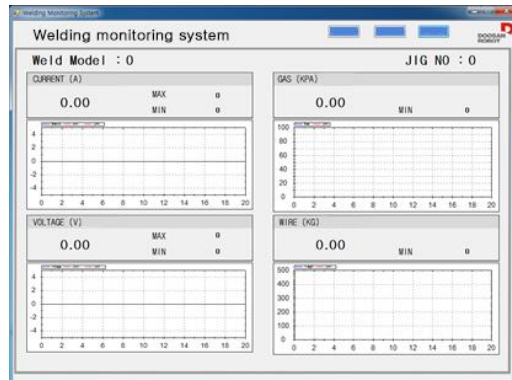


Fig. 2 PC software run screen for welding monitoring

### III. Results

Once a welding signal in the welding monitoring system is approved by sensors, it starts measurement and displays measurement results periodically. Fig 3 (a) and (b) depict the real time measurement results in normal and abnormal welding, respectively. The solid line in the voltage and current portion shows the value of the upper and lower boundaries to see the welding status, and 10% of the pre-established voltage and current is generally given for welding. As depicted in Fig 3(a), the welding voltage and current are between the upper and lower boundaries, but the current waveform in Fig 3(b) is out of both boundaries at 3 seconds which means abnormal welding. Therefore, the red rectangle box is displayed at the top to indicate the error.

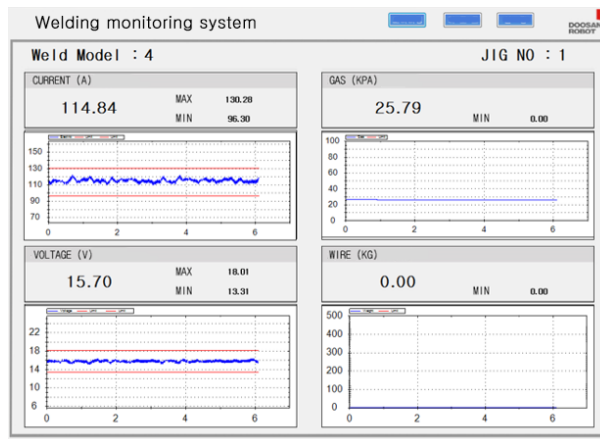


Fig. 3 (a) Monitoring screen in normal

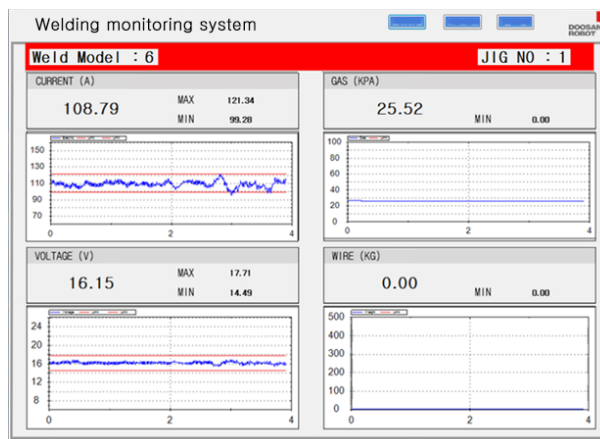


Fig. 3 (b) Monitoring screen in abnormal welding

#### IV. Conclusion

In this study, PC software and the monitoring system are developed to see welding quality using the Arc welding voltage and current. Welding quality is identified by the changes of the established welding voltage and current, and the program shows the measurement value of the voltage, current, and gas in graphs to users. Since data is stored in real time, it is possible to check which welding section changes the welding status. In addition, when abnormal welding occurs, the program displays the red rectangle box which means an error has occurred.

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