



# DIAL

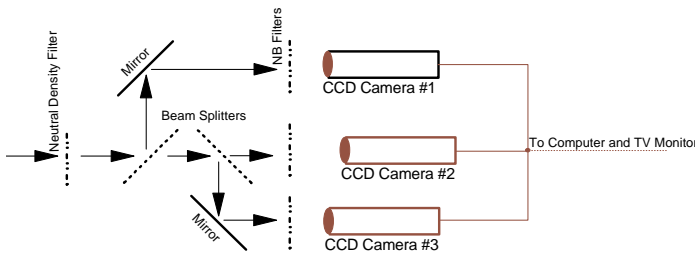
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## Multiwavelength Imaging

Multiwavelength imaging is a nonintrusive diagnostic technique developed at DIAL for monitoring plasma torch vitrification of mixed waste. Applications of the Multiwavelength Imaging system range from thermal imaging of high temperature surfaces to electrode lifetime monitoring. From thermal imaging, temperature contours and average temperatures could be extracted on-line as a reference for the torch operation. Plasma arc imaging reveals information about the torch operation control parameters and electrode erosion process. It may be used to monitor electrode health and indicate catastrophic failure.

### DESCRIPTION

The block diagram of the Multiwavelength Imaging system is shown here to indicate the general setup of the system.



The three CCD cameras are carefully aligned and synchronized to capture images of the same region of view at the same time. These cameras are equipped with electronic shutters with exposure times varying from 1/60 to 1/10,000 second, depending on the application environment. For plasma arc imaging, high speed (short exposure time) is needed because of the intense turbulent nature of the flow, while imaging a melt surface or the melt pour, a lower shutter speed (longer exposure time) is required because of the lower thermal emission. The three narrow band optical filters placed in front of the cameras are selected according

to the requirement of a particular application. For example, to monitor the plasma torch electrode lifetime, one of the cameras is used to monitor the continuum background emission, one is used to monitor silver emission where the silver has been imbedded inside the electrode, while the other one is used to observe the copper emission. Other interesting emission lines could also be selected for a different application objective. The application of the imaging system for the plasma torch electrode lifetime monitoring can greatly reduce the risk of a catastrophe from electrode failure in the middle of waste treatment, and give the facility operator the necessary warning and enough time to take preventive measures.

Thermal surface imaging, when the system is calibrated with a standard thermal emission source such as a blackbody, produces temperature distribution images. For application to vitrification technology, melt surface temperature distribution and average temperature can be obtained by the Imaging System in real time.

Currently, work is in progress to further broaden its application scope. Particularly, plasma arc image features extraction is of great interest. At the same time, the system is supporting DIAL's torch operation and field measurements.

Additional information about multiwavelength imaging may be obtained by contacting:

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