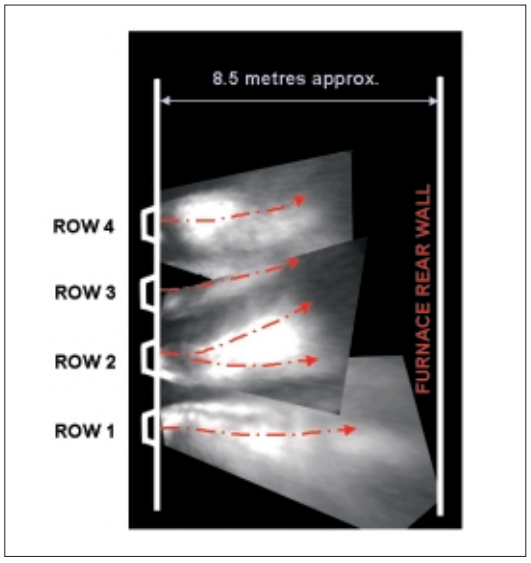
Advanced Monitoring Using Imaging for Combustion in Power Station Boilers

OBJECTIVES

Furnace cameras are used in large PF fired boilers to allow operators to observe combustion conditions. A number of these are installed in the UK to view oil light up burners, furnace deposition (low load) and for subjective assessment of the combustion conditions. Recent improvements in self illuminating video (SIV) imaging equipment and digital image processing together with the falling costs of the necessary hardware, mean that there is the potential to develop commercially viable systems to generate quantifiable performance parameters from boiler video cameras. This information can then be used for combustion improvements on utility boilers.

This programme aims to develop a prototype SIV system and test it in real environments in order to achieve the following objectives:

- to use SIV and image analysis techniques to identify adverse combustion conditions
- to provide a number of quantifiable parameters from video images which can be used to evaluate flame stability and combustion
- to develop software to run on a stand-alone PC system to provide the above information in real-time and transfer key parameters to existing data logging systems
- to develop systems to transmit and integrate video data from a number of cameras under actual boiler conditions
- to determine optimum video probe designs and locations for quantitative SIV



Volatile flame envelopes in full-scale utility boiler. Map of point fluctuation in instantaneous brightness, with approximate corrections for camera perspective, based on three sets of video observations at burner rows 2 and 4

SUMMARY

The three utility partners in the project will provide images from video camera probes on power station boilers. The positioning of the cameras will be investigated and trial video data will be recorded for off-line processing. A number of plant parameters will be logged during this period for comparison with video observations.

Robust software will be developed for real time SIV image processing of multiple-burner flame images. A prototype system for field testing and gathering long term data on derived combustion parameter trends will be installed on the boiler. Logged plant performance parameters and other data will be compared with SIV system measurements over extended periods of operation to assess system performance and guide development. The prototype will be progressively upgraded during the project taking into account feedback from the tests. In addition to investigating and developing techniques for suitable digital processing software, the most appropriate camera type, configuration, digitisation and networking technology will be investigated to give optimum data acquisition and allow integration of data from a number of cameras. A final version of the multiple-burner SIV system, including software for real time analysis, will be developed with detailed trials during the latter period of the project.

Video data for single burners will also be used to assess whether any significant improvements in flame monitoring performance might be obtained to offset the significantly greater cost of providing a video camera probe for each individual burner.

COST

The total cost of the project is £304 762 with a contribution of £114 451 from the DTI

DURATION

3 years commencing March 2000

CONTRACTOR

Imperial College of Science Technology and Medicine

In collaboration with

Innogy plc
TXU Europe Power Ltd
Eggborough Power Ltd
Imaging and Sensing Technology Ltd

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Project Profile 291