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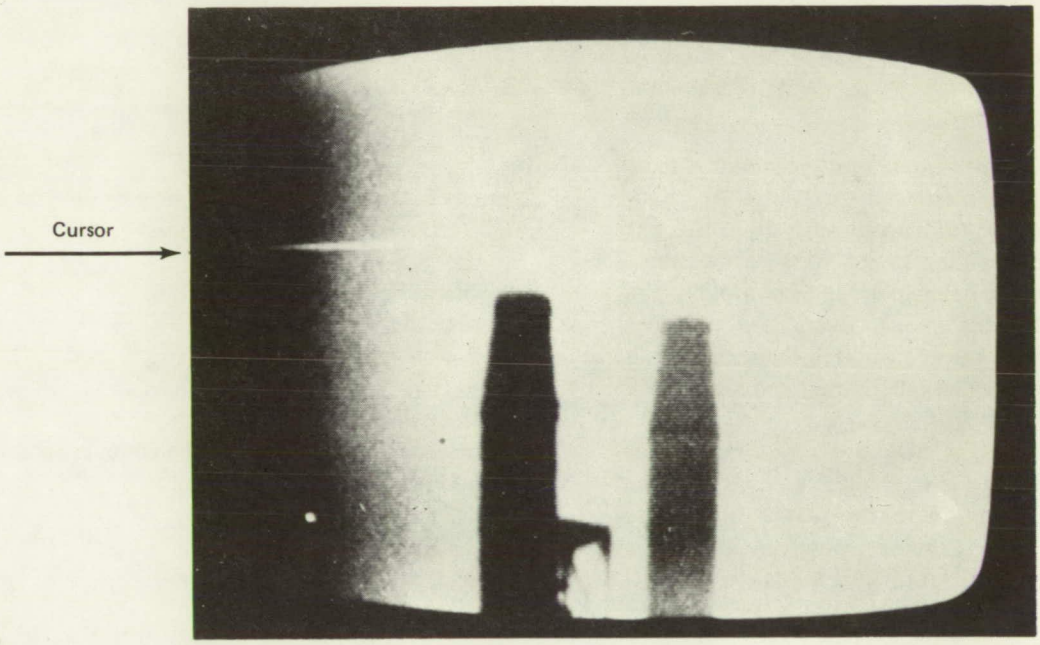
NASA TECH BRIEF

Langley Research Center

Visualization of Smoke Stack Plume

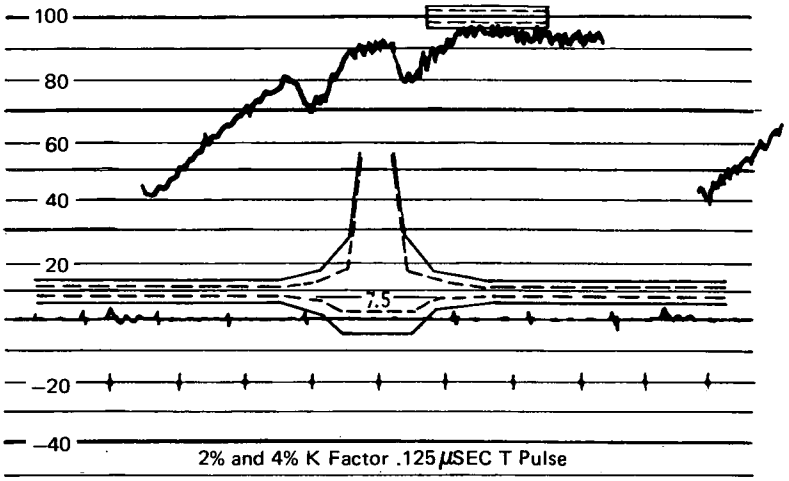


UV Vidicon Sensing SO_2 Absorption Against Sky Background
(Using 3150-Å Filter)

A system has been developed and tested at LRC which has the ability to "see" the plume of a smoke stack in its entirety and to properly assess plume instabilities. The illustration is an example of sulfur dioxide (SO_2) sensing applied to a coal burning power plant. The smoke stack displayed no sign of effluents when viewed by the eye but a plume is visible when viewed against the background sky at wavelengths where the SO_2 molecule absorbs light. The absorption due to SO_2 is easily perceived. The intensity along the cursor line shown, is displayed on the waveform analyzer. The absorption of SO_2 is quantified, allowing a measurement of the SO_2 concentration.

The system consists of an ultraviolet vidicon tube, interference and color filters, ultraviolet telephoto lens, a monitor, and a waveform analyzer to extract information from the video scene, a stack plume viewed against the sky. The analyzer permits quantitative measurements to be made at selected points in the field of view, which allows the SO_2 concentration to be measured. The result is a real time display of the plume coupled with a means of measuring the SO_2 concentration at any desired time. In this manner, measurements may be made at selected times when optimum conditions exist (i.e., no downwash and relatively uniform flow). It is possible for digital timing and video analyzer

(continued overleaf)



Intensity Along Cursor Line Displayed on Waveform Analyzer

information to be superimposed on the monitor screen along with the video scene and the composite picture to be tape recorded for future analysis. Tests have revealed that the recording aspect allows a measure of the effluent velocity by employing slow-motion playback techniques. In this mode, a fluctuation in the SO_2 concentration can be tracked through the scene and the velocity of the fluctuation (meter/second) can be measured.

This system will view SO_2 and any other element which absorbs light at the wavelength used, as it is based on a standard absorption technique. No interferents, however, should be encountered in power plant emissions of the coal or oil fired types for which it is intended.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Langley Research Center
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Hampton, Virginia 23665
Reference: B74-10208

Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

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