Guest Editorial

Optical Engineering

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Over the past ten years we have seen a vast increase in interest and research related to air pollution as a facet of the general environmental awareness. The buzz words fly thick and fast, and amidst all the rhetoric, it is difficult to know if any really significant scientific contributions have been or are being made. This issue, devoted in part to environmental optics, shows the SPIE's awareness of the field although this coverage is by no means even partially complete. It also offers me a forum from which to state at least one opinion on the realities of the situation.

Briefly, it is my feeling that much talk and fanfare have been expended by the government on the subject with little if any truly significant support in relevant areas of research. Let me explain it this way: In the classical control scenario we usually proceed in at least three clearly defined orderly steps. First, we attempt to measure or devise means of measuring what we wish to control. Second, we create or implement several methods of control. Third, we measure the system under dynamic conditions, with the instrumentation developed earlier, to see how well we are controlling and optimizing the system. Only then do we specify or legislate tolerable levels based upon long range goals and the calculated economic tradeoffs.

To be sure, one can attempt various abatement schemes and use gross measures to evaluate their success or failure, but this is neither efficient nor as long lasting as an optimum approach.

The situation has actually been just the opposite in control of air pollution and its sources. We first legislated maximum "tolerable" levels of pollution and maximum effluent rates from various sources. There followed the great panic to "control" the sources, using primarily brute force techniques such as the burning of cleaner fuel, mass scrubbing of dirty exhausts, etc. All of a sudden, to our chagrin, we realized what some had known all along — that

there were no mutually agreeable yardsticks or measuring instruments to tell us when and if we had made any real improvements in the ambient air, or more particularly in the effluent source emissions.

Burning low sulfur fuel and passing the effluent through scrubbers and precipitators will reduce the SO_2 level in the output but is this a good long term solution? Could we not have developed cheaper, more nearly permanent and more economical means to reduce sulfur dioxide levels? We may never know. The transient nature of brute force solutions, in the face of severe economic impact, is obvious now with the effects of the petroleum shortage on the low sulfur regulations. This is just one example of which the expensive catalytic auto exhaust purification systems are also typical.

The fact is that measurement schemes *do* exist and could have been developed a lot faster than they were had the correct priorities and logical scientific procedure been followed by the appropriate agencies.

In this issue we present three papers by key workers in the field of "Environmental Optics." Other papers devoted to closely related measurements, instruments, and standards will appear in later issues. It is my hope that in the quest for the ultimate \$500.00 air pollution monitor, the regulatory agencies will see fit to further investigate these promising but more costly techniques.

"I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot picture it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science, whatever the matter may be."

Lord Kelvin — 1883