INTRODUCTION

The consequences of the reactions of polymers, such as poly(buta-diene), ABS, and polypropylene, with atmospheric oxygen range from changes in color, flow, impact strength, etc., to explosion and fire, i.e.,

\[
\text{substrate} + \text{oxygen} \rightarrow \text{oxidative degradation.}
\]

Since oxidation is a common and generally undesirable event, particularly at elevated temperatures, a variety of methods have been developed to determine the relative oxidative stability of polymers and the effect of additives on the thermal oxidative stability of a substrate.\(^1\) Oxygen uptake measurement is one of those methods. The intent in using that method is to directly measure the consumption of one of the reactants, oxygen, as a function of time under a set of experimental conditions.\(^2\) Many oxygen uptake techniques have been devised, some of which include data recording with a strip chart recorder.\(^3,4,5\) The oxygen uptake system described in this paper is designed to provide a relative measure of oxidative stability which being operationally and mechanically simple and relatively inexpensive, so as to allow the manageable, simultaneous operation of many stations and facilitate data handling and analysis.

SYSTEM DESCRIPTION

The design of the system is schematically presented in Figure 1. In this variable pressure, constant volume system, each station is composed of a thin walled, disposable reactor fitted with a pres-
sure transducer. Pressure readings as a function of time are automatically collected and stored using the in-house computer system. Each station is independently controlled, including frequency of data point collection which can be varied during the course of the experiment. Data from any station can be displayed (digitally or graphically) at any time during, as well as after, an experiment via a graphic cathode ray tube (CRT) computer terminal. Analysis and manipulation of the data, such as determination of stabilization time, multiple overlay comparison, etc., as well as filing, is conducted with the assistance of RSI software.

The computer control organization, as displayed in Figure 2, is composed of three major sections. The first is a series of interactive Fortran programs, directly accessed from the Menu, that control data acquisition, maintain files, and display the status of each transducer in the system. Access to the second and third group of programs is described in the Menu.

The second section is composed of two interactive Fortran programs that utilize PLOT 10 subroutines to generate a station vacuum integrity check plot and a snap-shot plot of the data collected on a station. The third section is the RS/1 software package into which the data is copied. RS/1 is a very easy to operate and flexible program that is employed to assist the experimenter in all facets of data analysis, manipulation, filing, etc.