PURPOSE AND OBJECTIVES

The broad purpose of this investigation was to provide design criteria for selecting the knock-off tube that corresponds to the desired pressure and pressure-release time correlative with the static calibration of piezoelectric gages.

The technical objectives were as follows:

1. To develop and design a pressure system capable of delivering and maintaining hydraulic pressures in the range of 0 - 50,000 psi within a thick-walled pressure pot.

2. To derive a relationship between the pressure-release time and the initial conditions of the calibration system such as, quantity, compressibility, and viscosity of the pressurized fluid and the length and inside diameter of the knock-off tube.

3. To develop relations required for the selection of a knock-off tube which, when acting in the capacity of a quick pressure-release mechanism, will give prescribed pressure-release times.

PRESSURE-RELEASE TIME

Accurate determination of the pressure-time curve from an explosion necessitates precise knowledge of the pressure sensitivity and time resolution of the blast-measuring instruments, namely here, tourmaline piezoelectric gages and associated recording instrumentation. The pressure sensitivity is usually evaluated in two parts: (1) piezoelectric gage sensitivity is determined in terms of the charge developed by the gage for a unit change in applied pressure and (2) charge sensitivity of the cables, high-impedance amplifiers, and so forth, is determined in terms of oscilloscope deflection per unit charge (recorded on film). The time resolution of the pressure-time curve on the film record is determined in terms of oscilloscope sweep rate.

The sensitivity of a piezoelectric gage is determined by measuring the charge developed by the gage when either a static or dynamic pressure pulse is applied to it. Again a static pressure pulse is defined to be a pulse for which negligible mass flow occurs around the gage, and a dynamic pressure pulse is defined to be one for which the flow of fluid around the gage may be appreciable. Since the piezoelectric gages used in this Program are mounted on the internal walls of the model reactor vessels, the mass flow of fluid about the gages is considered to be negligible. Thus a static calibration of the gage is sufficient.

Static calibration of a piezoelectric gage is ordinarily obtained by placing the gage in a compression chamber filled with oil that is subjected to a known pressure. When the pressure in the chamber is released, the charge developed by the gage is determined via electronic equipment as explained later in the paragraph Instrumentation. The existing pressure