ABSTRACT

Development of the Manufacturing
Capabilities of the
Hydrostatic Extrusion Process

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The purpose of the present program is to develop the manufacturing capabilities of the hydrostatic extrusion process. Among the specific applications to be studied are fabrication of wire, tubing, and shapes from relatively difficult-to-work materials such as refractory metal alloys, high-strength steels and aluminum alloys, titanium alloys, beryllium, and other selected materials.

During the interim period, a study of the critical process variables (lubricants, fluids, stem speed, billet surface finish, die design, extrusion ratio, extrusion shape, etc) was continued for cold hydrostatic extrusion of AISI 4340 steel, 7075-0 Al, and Ti-6Al-4V. Some of the important results include: (1) extrusion of 7075-0 Al rounds at exit speeds up to 3000 ipm without surface cracking, (2) extrusion of AISI 4340 rounds at exit speeds up to 740 ipm, (3) extrusion of 7075-Al tubing, 3/4-inch ID x 0.063 inch wall, at exit speeds up to 450 ipm, and (4) extrusion of AISI 4340 tubing, 3/4-inch ID x 3/16-inchwall, and (5) extrusion of a 7075 Al T-section at exit speeds up to 1080 ipm.

Another objective of the program was to conduct an analytical study to evaluate several high-pressure container design concepts. This was done in anticipation of the need for large containers capable of withstanding very high pressures up to about 450,000 psi if possible. Designs were compared on the basis of maximum pressure capability, probable fatigue life, size efficiency, fabricability, and other characteristics.

PUBLICATION REVIEW

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