

<u>Trial</u>	<u>Extrusion Pressure, 1000 psi</u>			
	<u>Breakthrough</u>		<u>Runout</u>	
	<u>Stem</u>	<u>Fluid</u>	<u>Stem</u>	<u>Fluid</u>
424	220	191	162	137

The fluid-breakthrough-pressure peak with L52 lubricant was about 5.8 percent higher than that obtained under similar extrusion conditions with L17 lubricant. Also, the extrusion runout was accompanied by severe stick-slip. However, portions of the 75-inch length of extruded rod indicate that sound material with excellent surface finish was obtained. Attempts will be made to modify stearyl stearate lubricant with additions of MoS₂ and/or graphite in order to reduce the breakthrough-pressure peak and to minimize or eliminate stick-slip. As discussed later, extrusion of 7075-0 aluminum tubing with L52 lubricant indicates that further investigation is warranted.

COLD HYDROSTATIC EXTRUSION OF 7075-0 ALUMINUM AND AISI 4340 TUBING

Extrusion data for trials made to produce tubing from 7075-0 aluminum and AISI 4340 steel are given in Table 3.

7075-0 ALUMINUM

The extrusion trials with this high-strength aluminum alloy were directed toward:

- (1) Further evaluation of lubricants
- (2) Re-extrusion of tubing that had been previously hydrostatically extruded with the aim of obtaining thin-wall tubing.

In the lubrication studies, two new lubricants were evaluated: 20 w/o MoS₂ in castor wax, plus metallic lead, copper flake, and graphite (L48); and stearyl stearate (L52).

Data obtained with those lubricants, given in Table 3, indicate that they compare favorably in performance with L17 (References 4 and 5) in that they produce an excellent surface finish and that their pressures are of the same order.

In preparation for the re-extrusion trials, 7075-0 aluminum was annealed to about 65 Bhn. The billets were prepared by taking a cleaning cut on the billet surface to remove oxide formed during annealing.

TABLE 3. EXPERIMENTAL DATA FOR COLD HYDROSTATIC

Die Angle: 45 Deg
 Fluid: Castor Oil

Item	Trial	Die Orifice, in.	Billet Diameter, in.		Extrusion Ratio	Wall Thickness, in.	Stem Speed, ipm	Billet Lubricant
			OD	ID				
<u>7075-O</u>								
1	388	1.107	1.750	0.748	3.8	0.180	20	L48
2	425	1.107	1.750	0.748	3.8	0.180	20	L52
3	385(a)	0.875	1.104	0.748	3.2	0.063	20	L17
4	384(a)	0.782	1.104	0.748	12.9	0.017	20	L17
<u>AISI</u>								
5	389	1.107	1.750	0.748	3.8	0.180	20	L48
6	391	1.001	1.750	0.748	5.7	0.125	6	L48
7	386(b)	0.875	1.106	0.748	3.2	0.063	6	L48
8	390(c)	0.875	1.106	0.748	3.2	0.063	20	L48

- (a) Re-extrusion of tubing previously extruded in Trial 351 at a ratio of 3.77:1 and then annealed to 65 Bhn.
- (b) Re-extrusion of tubing previously extruded in Trial 355 at a ratio of 3.77:1 and not annealed.
- (c) Same as (b), except annealed after extrusion.