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To: <kgo@nrc.gov> Kenneth O'Brien
Date: 11/7/02 3:54PM
Subject: Flow Limiting Orifice Design.xls

Mr. O'Brien,

Here's the results of my Monday Morning noodling. Not very detailed on the descriptions I'm afraid. I used Crane 410 to come up with the flow formulas, and some excerpts from a paper I have on cavitation in valves, orifices, etc. I'll copy the stuff from the paper and bring it over. The stuff in red is input, the rest is calculated. I tried to maintain a margin to cavitation of ~2 (last column). The second sheet is where I created the critical cavitation index curve from published data.

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<<Flow Limiting Orifice Design.xls>>

A1328

Upstream Pressure 1400 psia
 Downstream Pressure 25 psia
 Vapor Pressure 4 psia
 Pipe ID 1.9 inches
 Required Flow 75 gpm
 Minimum orifice size 0.25 inches

Stage #	Pu	d (in)	n	β	C	dh (ft)	dP (psid)	Pd	σ	$\sigma_{critical}$
1	1400	0.4375	1	0.230	0.6	1105	478	922	1.92	0.91
2	922	0.3125	2	0.164	0.6	1061	459	463	1.00	0.64
3	463	0.375	2	0.197	0.6	512	221	241	1.07	0.76
4	241	0.375	3	0.197	0.6	227	98	143	1.41	0.76
5	143	0.4375	3	0.230	0.6	123	53	90	1.61	0.91
6	90	0.4375	4	0.230	0.6	69	30	60	1.86	0.91
7	60	0.5	4	0.263	0.6	40	18	42	2.18	1.08
8	42	0.5625	4	0.296	0.6	25	11	31	2.49	1.27
9	31	0.5	5	0.263	0.6	26	11	20	1.43	1.08

Ratio

2.12

1.55

1.40

1.84

1.78

2.06

2.03

1.96

1.33

Critical Cavitation Index

β	σ
0.2	0.08
0.3	0.14
0.4	0.225
0.5	0.375
0.55	0.47
0.6	0.58
0.65	0.72
0.7	0.92
0.75	1.25
0.8	1.6
0.85	2.3
0.9	3.8

$\sigma_{critical}$

