PRESSURE LOCKING EVALUATION FOR REQUIRED PULLOUT FORCE

= INPUTS

MOV 1-FCV-63-157
VALVE DWG 88517-3
MARK No. 8802A

Valve type = Flex Wedge

EPRI MOV PPP INTERNAL DESIGN INFO, Ref. ____

D1	E1	M1
4.28125	2.9375	2.5

a = ((D1 + E1) / 2) / 2 = 1.804688
b = M1 / 2 = 1.25 = ro
v=Poisson's Ratio = 0.3

u = friction coefficient based on Calc method. & EPRI results

theta = 1/2 total valve disk angle

VALVE DESIGN DATA

u =	0.4		theta=	5	deg
a=	1.8047	inches	ro=	1.250	inches
b=	1.250	inches	v =	0.3	

PRESSURE and TEMPERATURE DATA

Pbon =	2235	psi
Phigh =	25	psi
Plow =	0	psi
DP =	25	psid
Normal Temp =	0	F
Max Temp =	0	F
Delta Temp =	0	F
Pbonnet = Pbon + (Delta Temp*33psi/F)	2235	psi

ROARK FORMULAS

C2= (1/4){1-(b/a)2[1+2ln(a/b)]}	0.041969
C3= (b/4a){[(b/a)2+1]ln(a/b)+(b/a)2-1}	0.004014
C8= (1/2)[1+v+(1-v)(b/a)2]	0.817913
C9= (b/a){[(1+v)/2]ln(a/b)+[(1-v)/4][1-(b/a)2]}	0.2284
L11= (1/64){1+4(ro/a)2-5(ro/a)4-4(ro/a)2[2+(ro/a)2]ln(a/ro)}	0.000322
L17= (1/4){1-((1-v)/4)[1-(ro/a)4]-(ro/a)2[1+(1+v)ln(a/ro)]}	0.039121

Load Constant = (C2L17-C8L11)/(C2C9-C3C8) 0.218712

SEAT REACTION LOAD (BONNET psi)

Reaction at Hub Perimeter = QH(Bonnet) = Pbonnet(a)(Load Constant)	882.2	lb/in
Reaction at Seat: QS(Bonnet) = QH(Bonnet)(b/a)-(Pbonnet/2a)(a2-b2)	-438.2	lb/in

SEAT REACTION LOAD (Disk Area DP)

Reaction at Hub perimeter = QH(DiskDP) = (DP)(a)(Load Constant)	9.86767	lb/in
Reaction at Seat = QS(DiskDP) = QH(DiskDP)(b/a)-((DP)/2a(a2-b2))	-4.90133	lb/in

SEAT REACTION LOAD (Hub Area DP)

Force on Hub due to DP = Whub = QH(DPdisk)+(DP)PI(b^2))/2PI(b)	25.49267	lb/in
Reaction at Seat = QS(HubDP) = (-Whub)(b/a)	-17.6573	lb/in

Sum of Seat Reaction Loads = 2*QS(Bonnet)-QS(DiskDP)+QS(HubDP)	-889.114	lb/in
VF = mu/(cosA + musinA)	0.387951	
Thrust Load = VF*(Sum Seat Reaction)*(Seat Circumference)	-3911.15	lbs
Unwedging Load (Static test)	-4056	lbs
TOTAL THRUST = Thrust Load + Unwedging Load =	-7967.15	lbs

NOTE: THE NEGATIVE SIGN INDICATES THAT THE STEM IS IN TENSION

Rev. Prepared: RPod Checked: MRJohnson

244

PRESSURE LOCKING REQUIREMENT = 7967 lbs

ACTUATOR/VALVE CAPABILITY EVALUATION CALCULATION: EPM-RJP-022791

Actuator Model		SMB-0	
Motor Start Torque (MT)		40 ftlbs	
Overall Gear Ratio (OGR)		41.33	
Pullout Efficiency (PE)		40 %	
Application Factor (AF)	0.9 or 1.0	0.9	
Valve Factor (VF)	1.0 or (VF/460)**2	1.0000	430.6VAC
Stem Factor (SF)		0.0171	
Max Temperature (Temp)		215 F	
Loss Percentage (elevated temp)		23.4 %	Note 1
Torque Loss Factor = 1-Loss%*(Temp-104)/(356-77)		0.9069	
Actuator Torque Capability = (MT * OGR * PE * AF * TLF * VF)		539.75 ftlbs	SF =
Actuator Thrust Capability = Torque/Stem Factor		31564 lbs	0.0171
Actuator Thrust /Torque Rating		24000 lbs 500 ftlbs	
Valve Weak Link Thrust/Torque Rating		20200 lbs 345.42 ftlbs	SF = 0.0171
Seismic Thrust/Torque Rating		24000 lbs 410.4 ftlbs	SF = 0.0171

Note 1: Reference: Limitorque Technical Update 93-03

RESULTS:

PRESSURE LOCKING REQUIREMENT = 7967 lbs
ACTUATOR / VALVE LIMITING CAPABILITY = 20200 lbs

COMMENTS: