M. Packer Inflation Calculation S..et

Well Name: WW-2 Date: 4/13/99

Borehole/Casing Size: 4" stainless steel Completed By: GCG, LHM, MEM, JWP

Stainless Steel TD: 1005'

Stainless steel DTW 112.68m; 369.70 feet /2.3 = 160.7 psi

MP DTW: 109.02 m; 357.69 feet /2.3 = 155.5 psi

Inflation Tool Settings

Packer Valve Pressure (P_V) 170 (highest) psi *(low pressure valve ~ 5psi, high pressure valves ~ 140 psi, see packer labels)*

Maximum Packer Pressure (P_{MAX}) 180 psi *(See WJI ENV-0049.A, Attachment D – Maximum Packer Volumes and Pressures.)*

Injection Valve Pressure (P_{INJ}) 190 psi *(calculated by pressuring up tool and reading line pressure after 1 minute, 180 psi optimum, 150-200 OK)*

Hold Back Valve Pressure (P_{HB}) 210 psi *(must be at least 10 psi greater than open borehole DTW to hold back head in line so that location arm does not open prematurely)*

Tool Pressure (P_T) 400, 400, 420 psi *(measured during surface testing)*

$P_T = P_{INJ}$ when the hold back valve is not in the assembly
$P_T = P_{INJ} + P_{HB}$ when the hold back valve is in the assembly.

$P_{PUMP} - P_T$ = Pressure at which joints are tested.

Test regular couples and pumping ports to 150 psi, measurement ports to 100 psi.

Pump Pressure Calculation (for packer inflation)

Pump Pressure:
$P_{PUMP} = P_{INJ} + P_{HB} + P_V + P_{MAX}$ – stainless steel DTW + 100
$= 190 + 210 + 170 + 180 - 161 + 100 = 689$ (690) psi.

Logic: P_{INJ} and P_{HB} overcome the tool pressure. P_V provides the pressure required to open the packer valve. P_{MAX} is the pressure required to inflate the packer to its full capacity. The stainless steel DTW is subtracted because that is the surplus head acting on the tool to inflate the packer which is not balanced by head outside the casing. 100 psi is added to provide a positive flow into the packer.
Note: for packers above the stainless steel DTW, subtract the packer depth instead of the stainless steel DTW.

3.2808 feet/meter 0.433 psi/foot