LA-SUB-97-54

RECEIVED

FFR 17 1998

OSTI

SUMNER ASSOCIATES

100 Cienega, Suite D
Santa Fe, New Mexico 87501
Telephone: 505 984-8041 FAX 505 984-3251

FINAL REPORT

0412J0004-3Y

TASK 51

September 26, 1997

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

**Portions of this document may be illegible
electronic image products. Images are
produced from the best available original
document.**

3D Atlas Vertical Plate Oil Transmission Line Field Calculations

rfg 18-Sep-97

Because of questions regarding current density and inductance estimates of the Atlas oil transmission line in the region where the vertical plates connect to the disk line, calculations using the 3D FE program Flux3d were initiated. Flux3d inductance values are nearly that estimated by D. Scudder. Calculations for three base designs of E. Ballard and D. Pierce were completed where several variations for each base design were used to determine the important parameters affecting inductance and to check inductance consistency. Flux3d showed for the first base design a very high current density of 36MA/m at the connection between the vertical and horizontal ground plates resulting in a magnetic pressure of 120 kpsi. The second base design modified this connection to reduce the current density to 20MA/m and 36 kpsi and for design 3 current density is 17MA/m. Maximum current density on the hot plates is 20MA/m for all 3 designs. These values assumed 1.2MA per VTL or 45.6MA total system current. Electrical fields on the top of the hot plate near the disk line connection is about 50 per cent greater than the nominal value near the center of the vertical plates.

For the first two base designs, the vertical plate separation was 25.4mm, the vertical ground plate was 12.7mm wide, the hot plate was 38.1mm wide, and the height of the vertical hot plate at the connection was 500mm. In design 1, distance from the vertical hot cylinder (connects the vertical hot plate to the disk line) to the vertical ground plate was 38.1mm with a 45° break below the horizontal ground plate such that the connection between the two plates was 68mm from the hot cylinder. For the second design, distance from the hot cylinder to the edge of the ground plates was 47mm with no break - the inner edges of the ground plates are vertically aligned. Net system inductance (L) from the switch in the Marx tank to the start of the disk line is 4.32nH for both the first two designs. Decreasing the height of the hot plate to 250mm for a distance of 500mm increased L to 4.67nH for design 1, and for the second design, increasing the distance from the hot cylinder to the ground plates from 47 to 65mm increased L to 4.69nH.

There are many changes between designs 2 and 3. For design 3, the vertical transmission line (VTL) was moved downward at the Marx tank to accommodate cable connections, resulting in a more slanted line with an approximate length of 6680mm compared to the 6860mm of 1 and 2. Line dimensions were the same from the tank to a transition 790mm from the disk line where plate separation was decreased to 19.1mm and the ground plate width increased to 19.1mm. Distance from the hot cylinder to the ground plates is 38.1mm, and hot plate height is 250mm. Effects on L of decreasing this height was more than offset by the decrease in plate separation and distance from the hot cylinder to the ground plates. Flux3d estimated L for this configuration is 4.26nH. Doubling the

FLUX3D_2.2A		CAO-BIBS	V2.31 ECL/IEG LICENCE CNRS/INPG	tripalm
H on grn faces		DATE 9/17/97		
		rfg

FLUX3D_2.2A

CAO-BIBS

V2.31 ECL/IEG
 LICENCE CNRS/INPG

tripralmc

DATE 9/19/97

IHI on ground faces, 1.2MA, Dsgn2

rfg

250mm

38mm

Dsgn3(16Sep) 250mm high hot plate
At transition: 19mm grn, 19mm oil, 38mm hot plate w
Hmax=17MA/m, grn, 20MA/m hot plates
L(vtl)=4.26nH for VTL slant length=6680mm

15

10

5

0

MODV(HMAG1) 17 Min values=-1.664E-01 Max.= 1.681E+01 Incr.= 1.061E+0

FLUX3D_2.2A

CAO-BIBS

V2.31 ECL/IEG
LICENCE CNRS/INPG

trip9157

DATE 9/19/97

IHI on ground faces, 1.2MA, Dsgn3

rfg

FLUX3D_2.2A	CAO-BIBS	V2.31 LICENCE	ECL/IEG CNRS/INPG	tripnalm DATE 9/19/97
IHI on ground faces, 1.2MA, Dsgn1				rfg

MODV(HMAG1) 17 Min values=-1.664E-01

FLUX3D_2.2A	CAO-BIBS	V2.31 LICENCE	ECL/IEG CNRS/INPG	trip9157
H on ground faces, 1.2MA				DATE 9/16/97
				rf9

MODV(HMAG1) 17 Min values=-2.033E-01

FLUX3D_2.2A

CAO-BIBS

V2.31 ECL/IEG
LICENCE CNRS/INPG

trip9157

DATE 9/16/97

H on hot faces, 1.2MA

rfg