Interaction of a vortex ring with a natural convective layer C.A.
PALACIOS-MORALES, M. SALINAS, F.J. SOLORIO-ORDAZ, R. ZENIT, Universidad Nacional Autonoma de Mexico — We study the dynamics and heat transfer
resulting from the impact of a vortex ring with a vertical heated wall. Laminar vortex rings were generated in water with a piston- cylinder arrangement. The vertical
wall is heated by a thermal bath which is held at constant temperature producing a
laminar and stable thermal boundary layer. Measurements of the 2D velocity field
were obtained with a TR-PIV technique and the scalar temperature field is obtained
by the PLIF technique. To avoid azimuthal instabilities, we conducted experiments
for small stroke rations and Re of O(1000). The initial circular shape evolves to
an asymmetric shape after reaching the wall. The lower ring section thickens and
separates from the wall while the upper part thins and is dragged by the thermal
layer. On the sides, the vortex ring is stretched. The rate of change of circulation
is small at the lower section of the ring indicating that the momentum transport
and heat transfer is more significant in this region. The instantaneous heat transfer
coefficient was obtained; as expected, when the vortex approaches the wall, the heat
transfer increases mainly at the lower part of the ring.

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