The removal of a cylindrical core from thick wall sections for creep analysis by the relatively new WeldCore® process represents a very exciting methodology for obtaining more representative creep damage data from large engineering structures. Comprehensive creep sampling of 10CrMo910 high strength low alloy steel steam bearing pipes is currently a costly and time consuming process for South Africa’s energy supplier Eskom. Power plants have to be shut for days during maintenance to extract samples in order to ascertain the level of creep damage. This is currently done by means of conventional welding techniques which require skilled artisans. Friction Hydro Pillar Processing (FHPP) promises to reduce the amount of time and money spent on these activities as an alternative method of plugging the cavity left behind after coring.

The FHPP process involves rotating a cylindrical consumable stud concentrically inside a hole of nominally larger size. For materials that exhibit high flow stresses at temperature, tapers were introduced to both the stud and the prepared hole, with the hole typically having a larger taper. This allows for plasticised stud material to flow upwards, away from the shear interface. The Hydro Pillar portion of the process name is derived from the mechanism whereby some of the plasticised stud material is continually deposited onto previously recrystallised stud material, forming the base for the next layer. Under the correct conditions, a strong diffusion bond is achieved between the stud material and the parent plate.
This research presents data pertaining to taper Friction Hydro Pillar Processing as an alternative repair technique. Process parameters and weld preparation geometry are evaluated with distinct attention being given to the effect of change in downwards force on process response variables, weld defects and mechanical properties of 10CrMo910 steel. This includes tensile and fatigue strength of the welded joint.