The technological breakthrough in this submission is the design and demonstration of a high power clamping system that aligns pipe to API 5L / API 1104 specs to harvest the high production capability of the Internal Welding System.

The problem this innovation solves is aligning pipe with a low diameter to wall thickness (D/t) ratio. The lower this ratio the “stiffer” the pipe and the more power required to round the pipe and meet the API 1104 target specification of 3.2mm of high-low.

With the increased in the use of heavy wall pipe often combined with higher strength material, the High Unround Line-pipe Corrector (HULC) series of Internal Welding Machines (IWM) and Copper Back-Up Clamps (CBUC) are engineered specifically to address the needs of these types of pipes.

In order to minimize the high low on API-5L Spec pipe, a few features that were incorporated in this series of line up clamps are:

1. Bigger pneumatic cylinders instead of high pressure hydraulic cylinders
   a. Better cycle time
   b. No oil spills, reduced environmental risk
2. Double stacked pneumatic cylinders
   For 42” HULC-IWM & 36” HULC-CBUC, the cylinders produce over 425,000lb of radial thrust. When used on lighter wall pipe, the force is adjusted to reduced air consumption and provide the ideal clamping force. In some cases, the secondary cylinder can be bypassed.
3. Improvement in Mechanical Advantage
   The linear force of the cylinders is converted with a more robust link and pin mechanism into an outward thrust with a 6.25X force multiplier.
4. Reduction of end of pipe to clamp shoe distance
   Decreasing the spacing between the pipe end and the clamp shoes increases the deflection of the pipe end. By reducing this distance to 3” from 4.5” on the 36” CBUC, there is a calculated 25% increase in deflection at the pipe end achieving better fit up.
The HULC-IWM combines the unparalleled production capability of the internal welder with the high force needed to minimize the out of roundness of heavy wall API-5L spec pipe. The internal root pass welding system can deposit quality root passes in pipe with high-low up to 5mm.

The self contained pneumatic system operates the travel motors, brakes, drive wheels, aligners, front and rear clamping shoes. The HULC-IWM is capable of high travel speed (3’ per sec) and deployment speeds to achieve as much as 150 welds per day in double joint pipe.
The HULC–CBUC is designed to meet the needs of heavy wall pipe welding applications using automated GMAW/PGMAW equipment. By minimizing the high-low in the pipe to within the API-5L specifications and using a solid copper backing surface, the CBUC provides for excellent consistency and reliability of the weld bead quality. The solid copper tiles are robust and offer mechanical simplicity.

All functions are wirelessly controlled by a single operator, which decreases the time for fit-up and improves operator safety.

The 42” HULC-IWM was used in Michaels pipelines Acadia 42ich 0.975 and 0.687 wall project in Louisiana during the first quarter of 2011. The feedback from the jobsite is:

1. Reduced fit up time on pipe with severe flat spots
2. Reduced high-low and better quality of welds on highly out of round pipe
3. Significantly, higher production rates than other welding methods.