GP Drilling Supply, LLC

DRILL PIPE AND DRILL ROD MANUFACTURING PROCESSES

GP Drilling Supply, LLC sells drill pipe in sizes from 1.660" through 7-5/8" OD and in lengths from 5' to 47'. GPDS supplies drill pipe and accessories to fit nearly every make and model drilling rig World Wide.

The finest materials, processing and inspections in the industry, allows GPDS to sell their customers the highest quality products available.

To better understand the manufacturing Processes of both Integral and Inertia welded drill pipe, please read the following. If any questions arise, please do not hesitate to e-mail us at *gary.haub@gpdrillingsupply.com*

Upsetting

Drill Pipe has to withstand immense forces that also fluctuate rapidly. The pipe must continue to do this in spite of an abrasive and corrosive environment while subject to continual bending and stress.

Pipe with a uniform wall thickness will bend at the joints. Such pipes are weakest at the ends of the pipe (connections) and will most likely break in this area.

One method of strengthening pipe connections is to increase the thickness of the metal at the end of the pipe. The process used is termed "upsetting". The definition of upset is "To thicken and shorten (as a heated bar of iron) by hammering on the end." When pipe is "upset" there is more cross sectional area at the ends of the pipe. With a more cross sectional area there is more strength, which enhances the pipes performance after threading or welding.

There are three types of upsetting for drill pipe. (1.) External upset (2.) Internal/External upset and (3.) Internal upset. There are various methods for the upsetting of materials and we at GP Drilling Supply, LLC can help determine what would be the best process for your drill pipe needs.

Heat Treatment of Tubes

After the tubes are upset they go through a heat treatment process. Heat treating the mid body tubes to grade is accomplished by austenitizing, quenching and tempering of the tubes. There are several grades that are manufactured by this process. Generally E-75, X-95, G-105, S-135 and V-150 are the standard grades of drill pipe and drill rods. Some manufacturers produce "Proprietary" grades for special applications such as sour service. These grades are also available, but have to be defined before an order is placed. After the heat treatment process, the mid body tubes go through a SEA (Special End Area) and an EMI (Electro-Magnetic Inspection) to verify that the upsets are the correct dimension and free of any defects. The mid body tubes are checked for wall

verification as well as cracking due to the heat treatment process. A few tubes are then put through "destructive testing" to ensure the Tensile strength, thru hardness, and charpy impact strength meet API standards. Once the test pieces are finished and documented the drill pipe and drill rods are then ready for turning and boring before they can be threaded as an Integral joint or Inertia welded to a tool joint.

Integral Joints (upset)

Now that you understand "upsetting" it will be easier to grasp the theory of Integral drill pipe.

An Integral joint is a drill rod that is not a welded product. The pipe is upset on each end to a size that will enable the manufacturer to thread a pin and box connection onto the pipe. The pipe is heat treated to a comparable grade for the specified connections tensile and torsional values. The pipe is then inspected and goes through the threading, phosphate, inspection and finishing lines.

Inertia Welding

Inertia Welding is a metals-forming process much like forging. It is far removed from the "craft" nature of traditional welding methods. Quality, consistency and short cycle times are inherent in this process and are not dependent on the operator.

In preparation for Inertia Welding, one work piece (the pipe) is held stationary and the other piece (the tool joint) is clamped in a spindle chuck, usually with attached flywheels. The spindle chuck assembly is then rapidly accelerated to a preset speed and when the speed is reached the drive is cut off and the two pieces are thrust together. Friction between the pieces slows the flywheel and converts the stored energy to heat enough to soften but not melt the interfaces of the two parts. Just before rotation ceases the two parts bond. The remaining energy hot-works the weld, expelling voids and impurities and refining the grain structure. The weld is complete when the flywheel stops.

When a joint between similar materials is "solution-heat-treated" after welding, the weld zone is nearly restored to the original microstructure and is difficult to find even with a microscope.

In the drilling process drill pipe is exposed to underground forces and is highly loaded in rotary bending tension and torsion, thus great care must be taken at the weld joint to prevent a failure down hole. Upsetting the pipe ends ensures the wall at those ends is thicker than the nominal pipe wall. The tool joints are welded onto the upset ends making sure the weld area (cross-sectional) is large enough and the weld zone is at least 110% as strong as the nominal pipe body itself.

Since it's introduction in the late 1960's, Inertia Welding has grown to be one of the leading methods of materials joining in the Industry and is used by most Oil Country and Maxi Horizontal and Directional Drillers today.