

NAKATA developed a revolutionary pipe forming mill “Orbital Die Forming”

NAKATA Manufacturing Company has recently developed a completely new forming method which can make quality pipes with lower deformation strain and has higher productivity.

NAKATA is a general welded pipe plant supplier covering the whole equipment from entry section to finishing section. By making full use of self-developed high-speed high-precision **FEM Simulator**, NAKATA has



developed and brought many unique technologies into this industry like “**FFX Mill**” and “**Roll Box**”, which apply common-use roll technology and have high formability for quality round & square pipe production. Especially, nearly 50 sets of **FFX Mill** have been installed during the past ten years since its development, which make it win worldwide clients’ full confidence on the best pipe forming mill currently available in the world.

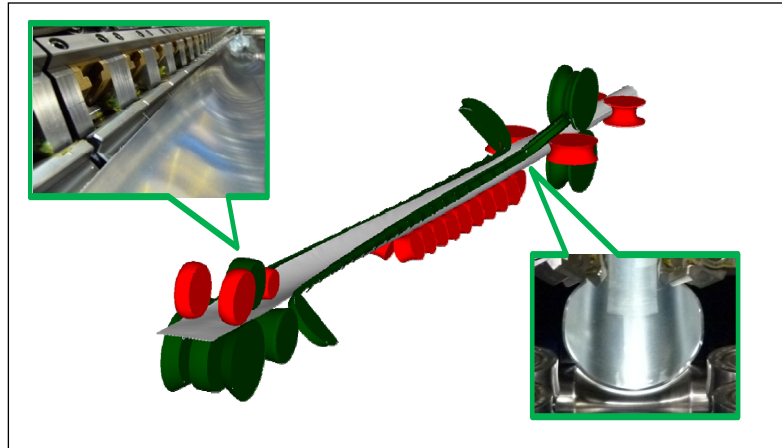
NAKATA keeps research and development to pursue the better quality pipe production. It is realized that there is a limitation in the traditional pipe forming method for a technical breakthrough.

Currently the pipe manufacturing methods can be classified into the following two categories basically.

The first category is roll forming. It is used widely till now owing to its high productivity and low investment cost for welded tube & pipe production. However, the excessive three dimensional deformation often gives high forming strain, high work hardening and complicated residual stress to the materials, which is the basic reason of the poor product quality. In addition, the limited contact between rolls and materials not only makes the forming unstable due to weak constraint but also brings high contact pressure, together with the unavoidable slip between the materials and rolls, which lead to bad pipe surface quality and short tool life. All of the demerits are hardly to be overcome as long as rolls are used as main forming tools.

The second category is press forming. Nearly plane deformation state over the product’s full length tends to less strain and then better product quality. But it also bring excessive forming load, which limit the product’s maximum length, productivity and require very costly press machine. This method is also only confined to short length pipe’s production.

NAKATA has developed a new pipe forming method named as “**Orbital Die Forming**” (ODF) method, aiming at inheriting the advantages from both above traditional methods.



In roll forming, it is known from long ago that the bigger the forming roll’s diameter is, the closer to plane deformation state the forming becomes. However, large rolls with the diameter range from several meters to dozens of meters are required to obtain this kind of ideal deformation mode, which is impossible to realize in reality. NAKATA succeeded in getting this kind of nearly ideal deformation state similar to press forming by inventing “Orbital Die Forming” (ODF) method. In this method, a multiplicity of die blocks moving in the circumferential direction on an endless track, are connected together to provide a tool surface with a very large curvature radius and work just like a huge roll.

This new forming method has both high productivity of roll forming method and excellent product quality of press forming method. Those products difficult to produce by roll forming such as pipes with very thin wall thickness, pipes with difficult-to-form materials now can be made easily. ODF shows great potential to meet the end user’s stricter needs such as automobile pipes with better secondary workability and quality line pipe with higher strength and thinner wall.

At the present, an ODF test mill has been built for experimental purpose and has shown encouraging performance. We are making it ready to be put in practical use as a new generation of pipe forming mill. It can be expected ODF will be on the market soon to satisfy the needs of pipe makers.

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