

# **Gleeble User Profile**

## **Tata Steel**

Tata Steel is multinational steel producer and a member of the Fortune 500. It was founded in 1907 in Jamshedpur, India. In the hundred years since its founding, it has grown into a global corporation with locations in 50 countries on five continents. It employs 80,000 people and has an annual crude steel production capacity of over 30 million tons.

Tata Steel's Jamshedpur Steel Works produces hot and cold rolled coils and sheets, galvanized sheets, tubes, wire rods and construction rebars. These are used in a variety of applications from aerospace to consumer goods. In addition, Tata Steel makes a variety of premium-quality steel products. Tata Steel's brands include Tata Steelium (the world's first branded cold rolled steel), Tata Shaktee (galvanized corrugated sheets), Tata Tiscon (re-bars), Tata Bearings, Tata Agrico (hand tools and implements), Tata Wiron (galvanized wire products), Tata Pipes (pipes for plumbing, irrigation and plant processes), Tata Structura (contemporary construction material), Galvano, Tata Shaktee Ultima and Hand Tools and Files from Tata Agrico.

Jamshedpur is also the location of Tata's Research and Development Division, which conducts research in process development, product development, physical and mathematical modeling of various processes, pilot plant studies for new technologies and technical services. Currently, 150 professionals research various aspects of steel manufacturing at this facility.

The Research and Development Department bought their first Gleeble in 1990, and recently purchased a new Gleeble 3800 with various attachments. The R&D team primarily uses their Gleeble 3800 for new product development and process improvements. They perform a number of tests on steel in this regard:

### ***Hot Rolling Simulation at High Strain Rates***

- Flow Stress Measurements
- Interrupted tests to understand evolution of microstructures
- Dilatometry
- Determination of  $T_{nr}$

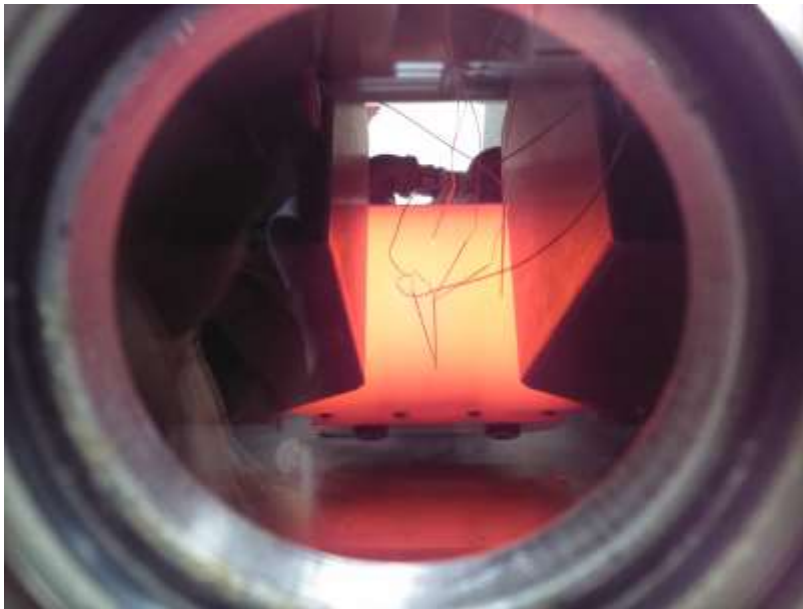
### ***Heat Treatment***

- Full scale annealing after cold rolling
- HAZ Simulation
- Simulation of thermal profile of various plant processes

### ***Casting***

- Hot Ductility tests
- SICO test

A Tata R&D spokesman said that the Gleeble 3800 has also been particularly useful in product development and in validating microstructural models. The Tata Steel R&D Department is using the Gleeble 3800 to replicate plant conditions in the laboratory and to evaluate the effects of various parameters such as strain, strain rate, cooling rate, and temperature. Furthermore, the researchers have found it very useful to use interrupted tests to freeze the microstructure of steel so they can examine the evolution of microstructure after each reduction, which is not possible on a plant scale.



**Fig. 1:** Continuous cooling simulation of a large cold rolled specimen

Recently, the Tata's R&D Department worked on an interstitial free high strength steel (IFHS) where a cold rolled material was subjected to a continuous annealing simulation. They wanted to assess the r-bar value for that grade after annealing treatment. The new annealing MCU of the Gleeble 3800 allowed the researchers to anneal a large sample (width >100mm) and gave them the ability to take out subsize tensile specimens from 0, 45 and 90° directions. (See Figure 1.) This kind of test with accurate control of temperature and cooling rates on such a large specimen was not possible earlier.



The Gleeble Team at Tata Steel