JFE has started pipe production in 1912. Backed by our long experience and advanced technology, we can meet any customer requirements and specifications. At present, we operate 10 welded pipe mills, two pipe coating mills and two seamless pipe mills. The following diagrams show the manufacturing processes used at JFE pipe and tube mills, including both the welded and seamless processes.

### Welding Processes

- **Submerged Arc Welding**
  - UOE Process
  - 64-inch UOE Mill (Chiba)
  - 56-inch UOE Mill (Fukuyama)
  - 100-inch Spiral Mill (Fukuyama)
  - 100-inch Spiral Mill (Chiba)

- **Spiral Welded Process**
  - 60-inch Spiral Mill (Chiba)
  - 60-inch Spiral Mill (Chiba)

- **High Frequency Welding**
  - Electric Resistance Weld Process
    - 24-inch HPW Mill (Kanagawa)
    - 6-inch HPW Mill (Chita)
    - 3-inch HPW Mill (Chita)
  - Electric Induction Weld Process
    - 4-inch CBW Mill (Kanagawa)

- **Continuous Butt Welding**

### Seamless Process

- **Rolling**
  - Mannesmann Plug Mill Process
  - Mannesmann Mandrel Seamless Pipe Mill (Chita)
  - Mannesmann-Mandrel Mill Process
  - Small Diameter Seamless Pipe Mill (Chita)

### JFE Manufacturing Processes

#### UOE Pipe Mill

UOE Pipe is manufactured in two works, West Japan Works (Fukuyama) and East Japan Works (Chiba). This flow diagram is an example of the Fukuyama mill. Each plate is subjected to ultrasonic inspection as deemed necessary before being transferred to the pipe mill. In the pipe mill, plate is trimmed and beveled on both longitudinal edges, then processed into a cylindrical shape by crimping, U-ing and O-ing press successively. The open can is washed inside and outside with high pressure water, then dried. Next, it is passed to continuous tack welding facilities. Subsequently, the seam is welded by automatic four-electrode submerged arc welding method first on the inside, then on the outside. The following step in the pipe fabrication process includes mechanical expansion and hydrostatic testing. The welded seam is inspected ultrasonically and radiographically. JFE also manufactures high grade line pipe, structural pipe and stainless steel pipe. If necessary, heat treatment is applied to pipes including quenching and tempering, normalizing, stress relieving and solution treatment.

#### Fukuyama UOE Pipe

<table>
<thead>
<tr>
<th>Location</th>
<th>Capacity (t./yr.)</th>
<th>OD Range</th>
<th>WT Range</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fukuyama</td>
<td>580,000</td>
<td>15.7~56in.</td>
<td>0.236~2in.</td>
<td>Max. 60ft (Max. 18.3m)</td>
</tr>
<tr>
<td>Chiba</td>
<td>540,000</td>
<td>20~64in.</td>
<td>0.250~1.75in.</td>
<td>Max. 60ft (Max. 18.3m)</td>
</tr>
</tbody>
</table>