Tega Industries Limited is a name synonymous with pioneering achievement in the mineral beneficiation, mining and bulk solids handling industries world over.

Tega's philosophy is to uphold traditional values through the empowerment of professionals. It's aim is to provide unrivalled technical and economical solutions to complex problems in mining, beneficiation, power, material handling and engineering.

Starting with development and manufacture of specialized wear resistant rubber lining, Tega today offers a range of rubber, polyurethane and ceramic based lining products, which have been incubated in its R&D center.

Today, the company offers value added consultancy services and solutions in areas of mineralbeneficiation and bulk solids handling, which have been tailored to suit specific requirements.

Our vision

To reinforce our current realm of products and services with technologically advanced products and solutions.

To have our products and solutions installed in every mining country in the world and provide support and services at each of our customer locations.

To be the world's most sought after company for providing solutions in wear applications and mineral processing.

Our Mission

"To distinguish ourselves in providing lasting solutions to the complex problems of material handling, wear and separation of ores found in mining and mineral processing industries".
Grinding Mill Liner

Grinding Mill

![Image of a grinding mill](image1)

Charge Motion inside Mill

Application

Grinding can be either dry or wet. Dry grinding has limited application because the use of water may be inhibited due to process limitation or it may bring about a change in the chemical composition. Grinding is mostly wet; Ore is ground by making it slurry with water.

Grinding Mill Lining

In a mineral dressing plant, the grinding mill body is consistently subjected to wear and tear from the ore as also the grinding media. Hence it needs to be protected by a replaceable lining that absorbs the impact and does not allow the same to propagate to the mill body.
Traditionally, lining has been made of steel. However, rubber as an alternative has gained global importance in the last three decades in wet grinding applications due to superior wear property (as shown in the figure).

In general, the cost of lining for a mill ranges between 10-40% of the total operation cost of a grinding mill. Hence, optimum selection of the lining material and its design is important for liner life and proper grinding efficiency.

**Design of Rubber Liner**

The liner, apart from protecting the steel shell of the mill from impact and abrasion, requires to effectively transfer power from the mill body to the charge to have cataracting and cascading effect. The lining thus needs to have plates and lifter with suitable profile.

**Basic Criteria For Good Rubber Lining Design**

**A/B Ratio:**

The space between consecutive lifter and the height of lifter above plate can be selected depending upon whether the liner is being selected for maximum life, maximum capacity or an optimum of the two.

**Ideal spacing for the two shell Lining:**

The number of rows of lifter depends upon the diameter and type of the mill.

*For Example:*

- The general rule for a Ball Mill is:
- No. of rows = \(2 \times D \div (\text{Dia of Mill in Feet} + 4)\)

*Depending upon the type of Mill*

**Operating Temperature:** \(< 70^\circ C\)

**pH level of Slurry:** 4 to 7.
Profile of the Lifter
The profile of lifter is selected mainly considering
a) Speed,
b) Mill Diameter
c) Ball Diameter

The profile determines the kidney formation. Ideally the grinding media should fall at the toe of the kidney. The section is done using software on “Ball Trajectory” simulation study.

Lining Thickness
The selection of Liner thickness is critical as it has direct effect on the capacity and power draw. Moreover, depending on the diameter of the mill, the effect becomes more pronounced as the diameter decreases – as shown in the figure.

<table>
<thead>
<tr>
<th>Thickness of Lining</th>
<th>2”</th>
<th>3”</th>
<th>4”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mill dia Inside Shell</td>
<td>100%</td>
<td>92.52%</td>
<td>85.43%</td>
</tr>
<tr>
<td>Ø6’</td>
<td>100%</td>
<td>94.44%</td>
<td>89.11%</td>
</tr>
<tr>
<td>Ø8’</td>
<td>100%</td>
<td>95.54%</td>
<td>91.25%</td>
</tr>
<tr>
<td>Ø10’</td>
<td>100%</td>
<td>96.37%</td>
<td>92.76%</td>
</tr>
</tbody>
</table>

Capacity/Power draw in relation to ID
Capacity is proportional to ID^{2.6}
Power draw is proportional to ID^{2.5}
ID = Diameter inside lining

Rate of wear of Liner
The wear rate of the Liner is dependent on many factors. Its relationships with some of the major operating parameters are shown below.
EFFECT OF LINER WEAR ON OPERATING PARAMETERS

- **Mineral and its hardness**
- **Liner wear as a function of feed size**
- **Grinding Media**
- **Effect of different charge volumes on the shell liner wear at Ncr < 78%, (g/kWh)**

**Mathematical Expression:**

\[
L2 = \frac{(N1)^2}{(N2)^2} \times L1
\]

- **N1** = “Old” speed
- **N2** = “New” speed
- **L1** = “Old” lifetime
- **L2** = “New” lifetime

Ex: Speed decreased from 83% NCR to 70% NCR.
Lifetime for 83% was 10,000 hrs.
\[
L2 = \frac{(83^3/70^3) \times 10000}{14059 \text{ hours}}
\]

**Design with Software Solution**

Tega uses high-end software models like Ball Path trajectory and Tega soft. These software help to simulate the grinding process with different options of the basic design features to predict the option which will provide optimum grinding performance with predicted power draw and impact spectra. These also facilitate finding solutions to grinding problems because the software links liner profile to operational parameters.
Basic Mill Lining Components

There are different components of a complete Mill Liner, which are designed to perform specific tasks.

1. Pulp Lifter
2. Grate Plate
3. Lifter Bar
4. Support Segment
5. Filling Segment
6. Shell Plate
7. Head Plate
8. Manhole Cover
9. Transition Liner
10. Centre Cone

Wear Measurement

The performance monitoring of the liner during its operation is of utmost importance. Tega believes in continuous monitoring and improvement. Thus Tega periodically collects the wear measurements of its lining either to predict the life of the liner or to suggest improvements.

Data collection of the profile of liner wear is done through specially designed wear measurements gauge. The data generated is then fed to customize software in order to generate the current profile of the liner of the liner with estimated remaining life.

The visual analysis of the same is the true representation of the condition of the liner.

However, what is not so apparent, but is nonetheless given for each case is the advice based on more than thirty years of experience, the predicted period for replacement.
GLOBAL SALES OFFICES

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<table>
<thead>
<tr>
<th>City</th>
<th>Address</th>
<th>Phone Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Durgapur</td>
<td>G-23 Saptarshi Sarani, Sector - 2B, Bidhannagar, Durgapur - 713 212</td>
<td>+91 343 2535181, +91 343 2535170</td>
</tr>
<tr>
<td>Bokaro</td>
<td>Plot No. 257, Co-Operative Colony, Bokaro Steel City (Near Nayamore), Bokaro - 827001, Telefax: +91 6542 258814/258902</td>
<td></td>
</tr>
<tr>
<td>Rourkela</td>
<td>Holding No. 241, Gupta Colony, Birsa Road, Hotel Satyam lane, Rourkela 769001, Ph: +91 661 2512515, Fax +91 661 2505556</td>
<td></td>
</tr>
<tr>
<td>Bhilai</td>
<td>34 / 14, 1st Floor, Nehru Nagar (West), Bhilai - 490020, Durg (C.G.)</td>
<td>+91 788 4011492, +91 788 4040782</td>
</tr>
<tr>
<td>Jamshedpur</td>
<td>Flat No. 12A, Road No. 1, Kaginagar, Sonari, Jamshedpur- 831041, Jharkhand, Telefax: +91 657 2227317</td>
<td></td>
</tr>
<tr>
<td>Barbil</td>
<td>Flat No. A-301, Block A, Sriniketan, VII Sundara, Unit No 13, PO &amp; PS Barbil, Keonjhar, Orissa. Phone: +91 9776060026</td>
<td></td>
</tr>
<tr>
<td>Vizag</td>
<td>Plot No. 24, Door No. 50-96-9/1, Seethammadhara, N.E. Layout, Vishakhapatnam - 530 013, Telefax: +91 891 2534693</td>
<td></td>
</tr>
<tr>
<td>Cuttack</td>
<td>O/o Abhaya Charan Choudhury, High Court Colony, Arunodaya Market, Link Road, Cuttack - 753012, Ph: +91 9937000493</td>
<td></td>
</tr>
<tr>
<td>Hyderabad</td>
<td>412, Maheshwari Chambers, Somajiguda, Hyderabad - 500082</td>
<td>+91 40 30602630</td>
</tr>
<tr>
<td>Bangalore</td>
<td>Kashi Kiran Mansion, Flat No 301, D No 110–116, 22nd Cross, Govindarajanagar, Vijayanagar, Bangalore - 560 040, Phone: +91 80 23207804 / Fax: +91 80 41672382</td>
<td></td>
</tr>
<tr>
<td>Hospet</td>
<td>&quot;Mathrubhumi Nilaya&quot; Door No 44, 7th Ward, Shankar Colony, M.P.Prakash Nagar, Hospet-583201, Phone: +91 9620227702</td>
<td></td>
</tr>
<tr>
<td>Chennai</td>
<td>Flat No. 6 (2nd Floor), 147 (68) Greaves Road, Chennai - 600006</td>
<td>+91 44 28292658, +91 44 28294738</td>
</tr>
<tr>
<td>Ahmedabad</td>
<td>706, 7th floor, Safal Preludes, Opp. Prahlad Nagar Garden, Off 100ft. Road, Satellite, Ahmedabad-380 015, Phone: +91 9909942823</td>
<td></td>
</tr>
<tr>
<td>Delhi</td>
<td>87 First Floor Zamrudpur, Opposite N Block GK1, New Delhi - 110 048, Phone: +91 11 32544197, Fax: +91 11 46099369</td>
<td></td>
</tr>
<tr>
<td>Udaipur</td>
<td>32 Pashen Ki Magri, Sewasram Chowk, Udaipur - 313 001, Phone: +91 294 2476735, Fax: +91 294 2415511</td>
<td></td>
</tr>
<tr>
<td>Goa</td>
<td>Flat No. S-3, Block No.A-1, Skylark Apartments, Nirvana Ness, Behind Pundalik Nagar, Ato-Porvorim, Goa - 403521, Phone: +91 9049006169</td>
<td></td>
</tr>
<tr>
<td>Mumbai</td>
<td>437D Second Floor, Yashi Plaza, Sector 17, Yashi, Navi Mumbai, Pin: 400705, Phone: +91 22 27890106, Fax: +91 22 27894640</td>
<td></td>
</tr>
</tbody>
</table>
Total Solution

1. Advanced Technology
2. Innovative Thoughts
3. Total Quality Management
4. Timely Deliverance
5. Unbeatable Teamwork
6. Theory in Practice
7. Corporate Transparency
8. Target Achievement
9. Skilled Technical Staff
10. National Presence
11. Tactical Edge
12. Built On Trust
13. IT Enabled Service

“(...) We are committed to creating value for our customers globally, by bringing them innovative technologies, products and services through our core business. (...)”

Total Solution is an outlook of how we provide products and services to meet customer requirements in order to establish and maintain the customer’s all important competitive edge by providing constructive solutions to their problems. The word ‘TOTAL’, other than being explanatory standalone, further encompasses various aspects as an acronym of how we provide solutions to our customers:

T  Trust : You can rely on us
O  Obsessed : We are engrossed in your work
T  Trained and Tailor-made : We have all the skills to meet your requirements
A  Accountable : We answer to you
L  Local : We are present wherever you are

As market forerunners, through our TOTAL Solution approach we provide customers with unmatched products and services by bringing in Global management practices and technology with a holistic approach towards excellence. Here at Tega, we put customer needs before everything else. We offer a vast range of integrated and adaptable products and services to empower every aspect of the customer’s business requirements.

Confronting problems head-on in collaboration with customers is what we seek to achieve. In order to reach the customer’s desired ‘solution’, we use the most technologically advanced products coupled with skilled support services. To elucidate this concept, we draw a parallel with the amalgamation of solutes and solvents to form a ‘solution’: Solute (Technologically advanced products) + Solvent (Skilled support services) = ‘Solution’

Summing it up, TOTAL Solution is an extension of the ‘T’ factor, which the Tega family extends to the daily operations of its customers.
METAL EMBEDDED RUBBER (PM) LINING

Tego PM Lining System was introduced first time on 1989. Extensive field tests revealed that metal embedded rubber liner, owing to its unique shock absorbing capacity has outperformed traditional liners in primary application. This paved the way for combination of rubber and metal to meet tough duty requirements in grinding application.

**Liner Types**

Depending upon the duty condition, the metal embedding is done on the lifters alone or on the plates as well. Selection of the type of metal to be embedded and its profile is also based on duty condition. It can be rolled or in cast form, depending upon the impact and abrasion resistance property needed for the application.

---

**Application**

Primary Grinding
AG/SAG Mills

Each mill liner is custom designed to suit the duty condition.

---

**Product Range**

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
<th>MKS</th>
<th>FPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifter Bar (Symetric &amp; Asymmetric)</td>
<td>1320 mm</td>
<td>250 mm</td>
<td>400 mm</td>
<td>52”</td>
<td>16”</td>
</tr>
<tr>
<td>Shell Plates (Symetric &amp; Asymmetric)</td>
<td>1320 mm</td>
<td>500 mm</td>
<td>160 mm</td>
<td>52”</td>
<td>20”</td>
</tr>
</tbody>
</table>

Note: Other lengths are available on request.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Wear.</td>
<td>Life is 2-5 times compared to steel or rubber lining.</td>
</tr>
<tr>
<td>Predictable wear life.</td>
<td>Planned shutdown. Improved production.</td>
</tr>
<tr>
<td>Differential wear pattern in different portion of mill is taken care.</td>
<td>Substantial saving in downtime for avoiding replacement in parts.</td>
</tr>
<tr>
<td>Leak proof fastening system.</td>
<td>Better protection of mill body, from corrosion.</td>
</tr>
<tr>
<td>Less weight, easy to handle.</td>
<td>Reduced installation time. Improved production.</td>
</tr>
<tr>
<td>Noise level reduced.</td>
<td>More environment friendly.</td>
</tr>
<tr>
<td>Less weight on rotating parts.</td>
<td>Longer life of rotating parts.</td>
</tr>
<tr>
<td>Safer attachment system ensures no bolt breakage.</td>
<td>Mill availability improves due to less maintenance and fewer and shorter stoppages.</td>
</tr>
</tbody>
</table>

Tega PM liner are installed in over 10 countries around the world including:
- Australia
- Canada
- Ghana
- India
- South Africa
- Sweden

Tega Liner in SAG/AG Mill
Mill Size: Dia 6.15 m x 7.6 m
Ball Size: 125 mm
Ore Handled: Gold
RUBBER LINING
FOR BATCH & CONTINUOUS MILLS

The yield on grinding operation is highly dependent on the performance of mill linings. Within the ceramic industry, the most commonly used types of mills are Batch and Continuous Mills, while stone lining is the most frequently used lining in this industry. However, Rubber has been steadily gaining in importance as protection against wear and tear in Batch Mills.

It is observed that when converting a 6’x6’ batch mill with 125mm thick Silex lining to a thin rubber lining, a capacity increase of 30% is achieved. Moreover, smooth liners usually need higher mill speed to get sufficient grinding efficiency as against rubber lining with lifters. For a smooth lining, the best result is obtained at 60% of critical speed, causes additional slippage between lining and charge, which increases the energy consumption as well as the rate of wear of both lining and grinding media.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Stone Lining</th>
<th>Tega Lining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight of Lining</td>
<td>9000 kg</td>
<td>2300 kg</td>
</tr>
<tr>
<td>Available Mill Volume</td>
<td>6.12 cu.m.</td>
<td>7.4 cu.m.</td>
</tr>
<tr>
<td>Time required for installation</td>
<td>20 days</td>
<td>3 days</td>
</tr>
<tr>
<td>Power consumption</td>
<td>69 kwh/t</td>
<td>43 kwh/t</td>
</tr>
<tr>
<td>Mill capacity</td>
<td>240 Kg/h</td>
<td>400 Kg/h</td>
</tr>
<tr>
<td>Batch time</td>
<td>12 hrs</td>
<td>10 hrs.</td>
</tr>
</tbody>
</table>

Tega batch mill lining is tailor made and can be used for straight head, semi cupped head or cupped head.
A Continuous Grinding Mill is the most appropriate investment for the ceramic industry, as it makes automation of the production process possible. The continuous grinding technique reduces labour cost, requires less space (50%), consumes less power (25%) and fuel (15%) and eliminates idle periods for loading and unloading. Tega lining for continuous mills is designed that the appropriate lifter bar design, width, height and spacing, as well as plate thickness are used. The 1st chamber lining is designed to achieve optimal impact grinding performance. Commonly used grinding media here are flint-pebbles. The 2nd and 3rd chambers in a continuous mill are usually designed for secondary/attrition grinding. A rubberised diaphragm is provided between two chambers to obtain efficient screening.

<table>
<thead>
<tr>
<th>Features</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Lower lining thickness.</td>
<td>Increase capacity.</td>
</tr>
<tr>
<td>Profile lining.</td>
<td>Reduced slippage. Reduced power consumption/ton of grinding.</td>
</tr>
<tr>
<td>Less downtime during installation.</td>
<td>Increased availability of milling time.</td>
</tr>
<tr>
<td>Leak proof fastening system.</td>
<td>Better protection of mill body from corrosion.</td>
</tr>
<tr>
<td>Predictable wear pattern.</td>
<td>Planned shutdown. Improved production</td>
</tr>
<tr>
<td>Less lining weight.</td>
<td>Improved life of rotating parts of mill also less risk of accident during installation.</td>
</tr>
<tr>
<td>Low noise level</td>
<td>Environment friendly.</td>
</tr>
</tbody>
</table>
RUBBER MILL LINING

Tega introduced specialized rubber lining technology in 1976. Till then steel had been accepted traditionally as lining material. As a result of its powerful assimilation of technology in tandem with a vast database, over 30 years of on-site experience and over 350 installation, Tega is an established solution provider, in the field of wear resistant mill liner today, providing optimal grinding solution to major mineral processing plants all over the world.

Apart from the design, the uniqueness of Tega Rubber lining is in the formulation of compound incubated at its R&D cell and maintained through quality assurance wing.

Ball Mill with rubber liner

Litter with shell plate

Liner fastening system

Application

- Secondary/Regrind Mill.
- Washing Drum/Scrubbers.

Each mill liner is custom designed to suit the duty condition.

<table>
<thead>
<tr>
<th>Product Range</th>
<th>MKS</th>
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<tbody>
<tr>
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<td>Length: 1320 mm</td>
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<tr>
<td></td>
<td>Width: 500 mm</td>
<td>20”</td>
</tr>
<tr>
<td></td>
<td>Height: 160 mm</td>
<td>6.3”</td>
</tr>
</tbody>
</table>

Note: Other lengths are available on request.
<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less wear.</td>
<td>Longer life, less cost of liner/ton of grinding.</td>
</tr>
<tr>
<td>Less downtime during installation</td>
<td>Increased availability. Higher capacity utilisation.</td>
</tr>
<tr>
<td>Predictable wear pattern.</td>
<td>Planned shutdown, Improved production.</td>
</tr>
<tr>
<td>Easy to handle.</td>
<td>User friendly during installation.</td>
</tr>
<tr>
<td>Reduction in noise level.</td>
<td>Environment friendly. Reduced noise pollution.</td>
</tr>
<tr>
<td>Leakproof fastening system.</td>
<td>Better protection of mill body from corrosion.</td>
</tr>
<tr>
<td>Less weight on rotating parts</td>
<td>Longer life of rotating parts</td>
</tr>
<tr>
<td>Customised wear measurement.</td>
<td>Prediction of liner life and improvement.</td>
</tr>
</tbody>
</table>

**Tego Liner in Ball Mill**

- **Mill Size**: 5.2 m × 10.6 m
- **Ball Size**: 30 mm
- **Mill Speed**: 70% of critical speed
- **Ore Handled**: Iron

**Liner in Scrubber**

- **Scrubber Size**: Ø6.1x11.5 m long
- **Speed**: 55% of critical speed
- **Ore handled**: Gold

**Installation & Service**

Tego has a full fledged installation and service department whose experienced personnel offer installation services anywhere in the world.