Integration of TPM & TQM through the X - Matrix
BRAKES INDIA LIMITED
A Joint Venture of TVS And TRW

TVS – GROUP
SALES: US$ 3.9 BILLION
27,000 PEOPLE
28 COMPANIES
45 LOCATIONS

TRW – AUTOMOTIVE
SALES: US$ 16 BILLION
80,000 PEOPLE
25 COUNTRIES
200 LOCATIONS
TVS Group – Portfolio

Auto Components

Air Suspension
Axles
Brakes
Castings
Electricals
Fasteners
Friction materials
Rubber Products
Radiator Caps
Tyres
Turbo Chargers
Wheels

2 Wheeler Manufacture

Vehicle Sales & Service

Parts Distribution

Finance & Insurance
<table>
<thead>
<tr>
<th>Profile</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year of establishment</td>
<td>1981</td>
</tr>
<tr>
<td>Location</td>
<td>Sholinghur, 120 Kilometer from Chennai</td>
</tr>
<tr>
<td>Number of employees</td>
<td>727</td>
</tr>
<tr>
<td>Total area</td>
<td>76 Acres</td>
</tr>
<tr>
<td>Built up area</td>
<td>28,000 Sq. Mts.</td>
</tr>
<tr>
<td>Sales turnover</td>
<td>Rs 4.95 Billion (US $ 124 Million)</td>
</tr>
<tr>
<td>Production volume</td>
<td>76,843 MT</td>
</tr>
<tr>
<td>Exports share of turnover</td>
<td>55%</td>
</tr>
<tr>
<td>Industries catered to</td>
<td>- Automotive, 87%</td>
</tr>
<tr>
<td></td>
<td>- Refrigeration &amp; Air conditioning, 13%</td>
</tr>
<tr>
<td>Year</td>
<td>Event Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
</tr>
<tr>
<td>1998</td>
<td>Declaration by the Top Management</td>
</tr>
<tr>
<td>1999</td>
<td>Introductory Session by Mr. Kazuo Kawashima JIPM</td>
</tr>
<tr>
<td>2000</td>
<td>TPM Kick Off – 4th October 2000</td>
</tr>
<tr>
<td>2003</td>
<td>Award for TPM Excellence – First Category</td>
</tr>
</tbody>
</table>
# TQM Journey

<table>
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<th>Event</th>
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<td>1998</td>
<td>Declaration by the Top Management</td>
</tr>
<tr>
<td>From 1999</td>
<td>BIF chose to learn TQM through cluster approach with Quality Guru Prof. Y Tsuda spearheading the learning.</td>
</tr>
<tr>
<td>2003</td>
<td>Deming Application Prize</td>
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</table>

![Image of Deming Medal]

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*Brakes India, Foundry Integration of TPM & TQM*
From Manufacturing Excellence to Business Excellence

Manufacturing Excellence → Business Excellence

2004 → 2010

Paradigm Shift

Difficult to respond conventionally

Management Innovation is required
Business Development should drive TPM & TQM efforts
The way forward

Value Chain

Premium

Cost-oriented Foundries

Full Service supplier

Contract Manufacturers/Job shops

Cost-oriented Foundries

Innovation-oriented Foundries

BIF need to move in this direction

Volume

Customer

Engineering  Melting  Casting  Cleaning  Machining  Parts assembly  Module assembly

Value Chain
BIF should attempt to be 3 years ahead of competition
Policy Deployment

Business plan (every year – rolling for next five years)

Yearly objective selection process

Yearly objective (X - Matrix)

Identify company guidelines for the year

Deploy the objectives to the pillars

Identify the action plan

Implement the actions

Review performance against set objectives for achievement

Yes

No

Identify the gaps

Analyse the gaps and identify countermeasures

Plan

Do

Check

Act
The way forward

To be 3 years ahead of competition,

Linking of objectives

Vision → LTO → MTO → Results
To be 3 years ahead of competition

We shall achieve customer satisfaction by providing products and services of high quality at globally competitive prices. We shall be a leading player in our chosen area of operations in the light engineering industry.

We shall improve the quality of life of our employees and fulfil their reasonable aspirations. By creating an atmosphere of trust and care, we shall work as a cohesive team always encouraging higher standards of performance.

We shall provide an adequate return to our stock holders and facilitate the growth of the organisation.

We recognize our vendors as our partners in progress. We shall give them a fair deal and nurture a healthy relationship.

We shall conduct ourselves as a responsible corporate citizen known for integrity and ethics.
To be 3 years ahead of competition

Vision

We shall provide an adequate return to our stock holders and facilitate the growth of the organisation.

LTO

Establish a reputation so that share holders take pride in the company and faith in the management.

MTO

Recognize customer expectations and work towards cost reduction year over year.
Key focus areas from the MTO

- Energy
- Yield
- Operation
- Research & Development
- Marketing
None can be ignored –
With increasing clock speed, this cycle rotates faster & faster!!
Mere improvements will not do, we need breakthrough.

Breakthrough is the only way to be ahead of competition by three years.
The way forward

Achieve Breakthrough in the Key Focus Area by

Integrating TPM and TQM through X – Matrix.
The X - Matrix

- Focus on a shared goal.
- Involve all in planning to achieve the goal.
- Hold pillar chairman accountable for achieving their part of the plan.
- Communicate that goal to all levels.
The X - Matrix

Guide Lines

Key Focus Area from MTO

Objectives

Action Plan
Integrating TPM & TQM through X-Matrix

Policy Deployment through X-Matrix

Energy Management → Yield Management → Operation Management → R&D → Market

KK → JH → PM → QM → DM → EM → OTPM

E&T → SHE
Rules for making Guidelines

1. Guidelines should be such that there should be extension in the way of thinking

2. Guidelines should not be too many. App (5 - 6) are sufficient
Rules for making objectives

1. Objectives should be SMART

2. Objectives should be clearly understood by all

3. Objectives should not be bureaucratic

4. Think of your “Added value” as a pillar chairman while selecting the objectives. The objective should be challenging for the pillar.

5. Objectives can be added upon if new idea come up during the year.

6. Use as many guidelines as possible while selecting your objectives.
Rules for making Action Plans

1. The action plan should be specific & should come from the pillar.
2. Action plan should not be too many.
3. Action plans should be breakthrough action plan & not routine in nature.
4. Action plans should be selected after formulating the objectives & not vice versa.
5. There should be a target date for each plan.
## Integrating TPM & TQM through X-Matrix

### Objectives

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<th>Action Points</th>
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<td>Reduce energy cost from 22% to 15% of the Turn over</td>
<td>PM PM KK KK QM DM PM KK OTPM E &amp; T</td>
<td>Jun-08 Dec-08 May-08 May-08 Jul-08 As per Plan May-08 Aug-08 May-08 May-08</td>
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### Company Objectives Derived from MTO

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<th>Rs. 17 Million</th>
<th>Reduce the melting energy consumption to 525 kWh / Ton of metallics</th>
<th>x x x x x x x x</th>
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<tbody>
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<td>Rs. 7 Million</td>
<td>Reduce the auxiliary energy consumption to 200 kWh / Ton of metallics</td>
<td>x x x x x x x x</td>
</tr>
<tr>
<td>Rs. 25 Million</td>
<td>Reduce the energy tariff by increasing the proportion of renewable energy usage</td>
<td>x x x x x x x x</td>
</tr>
<tr>
<td>Rs. 6 Million</td>
<td>Reduce the energy tariff by improving the powerfactor</td>
<td>x x x x x x x x</td>
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### Energy Monitoring and Reporting System

- Imparting the knowledge on the energy conservation techniques
- Reduce the melting energy consumption to 525 kWh / Ton of metallics
- Reduce the auxiliary energy consumption to 200 kWh / Ton of metallics
- Reduce the energy tariff by increasing the proportion of renewable energy usage
- Reduce the energy tariff by improving the powerfactor

### Action Points

- Increase the Density of Charge material from x to y
- Modify Design of the furnace for energy efficiency
- Reduce the charging cycle time loss by modifying the Canes
- Reduce Energy loss through Radiation in the Ladles
- Conduct a Design Of Experiments for Optimisation of the Input Materials
- Increase the Output / Input Ratio in the Pattern Plates
- Eliminate the conveyor by Re-designing the layout
- "Karakuri" - Redirect the SBC air Exhaust for Mould Blow Off
- Energy Monitoring and Reporting System
### Objectives

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<td>X</td>
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<tr>
<td>Increase CAGR</td>
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<td>X</td>
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<td>New value proposition</td>
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<td>X</td>
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<td><strong>PM</strong></td>
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<td>Modify the Design of the Furnace for Energy Efficiency</td>
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<td>Increase the Density of the Charge by modifying the equipment design.</td>
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<th>QM</th>
<th>DM</th>
<th>PM</th>
<th>KK</th>
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<td>May-08</td>
<td>Jul-08</td>
<td>As per Plan</td>
<td>May-08</td>
<td>Aug-08</td>
<td>May-08</td>
<td>May-08</td>
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**Guidelines**

- Increase the Density of Charge material from x to y
- Modify the Design of the Furnace for energy efficiency
- Reduce the charging cycle time loss by modifying the Canes
- Reduce the Energy loss through Radiation in the Ladles
- Conduct a Design Of Experiments for Optimisation of the Input Materials
- Increase the Output / Input Ratio in the Pattern Plates
- Eliminate the conveyor by re-designing the layout
- "Karakuri" - Redirect the SBC air Exhaust for Mould Blow Off
- Energy Monitoring and Reporting System
- Importing the knowledge on the energy conservation techniques
## KK Pillar on Energy Management

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<th>Business excellence</th>
<th>Increase CAGR</th>
<th>New value propositions</th>
<th>Be 3 years ahead</th>
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### Objectives

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### Energy Monitoring and Reporting System

**Imparting the knowledge on the energy conservation techniques**

**Reduce the melting energy consumption to 525 kWh / Ton of metallics**

**Reduce the auxiliary energy consumption to 200 kWh / Ton of metallics**

**Reduce the energy tariff by increasing the proportion of renewable energy usage**

**Reduce the energy tariff by improving the powerfactor**

### Action Points

- Reduce the charging cycle time loss by modifying the crane.
- Reduce the operating temperature by 50 Deg C by reducing the temperature loss.
- Increase the Output / Input Ratio in the Pattern Plates
- Eliminate the conveyor by Re-designing the layout
- "Karakuri" - Redirect the SBC air Exhaust for Mould Blow Off
- Increase the Density of Charge material from x to y
- Reduce the energy loss through Radiation in the Ladles
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- Importing the knowledge on the energy conservation techniques

### Objectives

- Reduce the charging cycle time loss by modifying the crane.
- Reduce the operating temperature by 50 Deg C by reducing the temperature loss.
- Reduce the energy cost from 22% to 15% of the Turn over

### Guidelines

- Reduce the operating temperature by 50 Deg C by reducing the temperature loss.
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**Rs. 6 Million**

Reduce the energy tariff by improving the powerfactor

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**Brakes India, Foundry**

**Integration of TPM & TQM**

**Page 27**
Combined effect of kaizens for reducing Temperature losses

Other major benefit:
40°C reduction in treatment temperature reduces the expensive Fe-Si-Mg alloy consumption. This results in 30% reduction in the cost of alloy addition.

40°C reduction in Operating temperature results in energy saving of 20kwh/Ton
| Rs. 17 Million | Reduce the melting energy consumption to 525 kWh / Ton of metallics | X | X | X | X | X | X | X | X | X |
| Rs. 7 Million | Reduce the auxiliary energy consumption to 200 kWh / Ton of metallics | X | X | X | X | X | X | X | X |
| Rs. 25 Million | Reduce the energy tariff by increasing the proportion of renewable energy usage | X | X | X | X | X | X | X |
| Rs. 6 Million | Reduce the energy tariff by improving the powerfactor | X | X | X | X |

**QM Pillar on Energy Management**

**Company Objectives Derived from MTO**

<table>
<thead>
<tr>
<th>Objective</th>
<th>In-6 of May</th>
<th>In-6 of Jul</th>
<th>Jun-08</th>
<th>Jul-08</th>
<th>Aug-08</th>
<th>Sep-08</th>
<th>Oct-08</th>
<th>Nov-08</th>
<th>Dec-08</th>
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</thead>
<tbody>
<tr>
<td>Reduce energy cost from 22% to 15% of the Turn over</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**QM**

**Conduct a Design of Experiments for Optimisation of the process parameters**

<table>
<thead>
<tr>
<th>Action Points</th>
<th>May-08</th>
<th>May-08</th>
<th>May-08</th>
<th>May-08</th>
</tr>
</thead>
<tbody>
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<td>Reduce the Energy loss through Radiation in the Ladles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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**Customer loyalty**
Create new customer / markets
Business excellence
Increase CAGR
New value proposition
Be 3 years ahead of competitors

**Objectives**

- **Guidelines**

- **Action Points**

  - Reduce the melting energy consumption to 525 kWh / Ton of metallics
  - Reduce the auxiliary energy consumption to 200 kWh / Ton of metallics
  - Reduce the energy tariff by increasing the proportion of renewable energy usage
  - Reduce the energy tariff by improving the powerfactor

**Integration of TPM & TQM**
## DM Pillar on Energy Management

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### Company Objectives

- Increase the Output / Input ratio (Yield) in the Pattern Plates
- Reduce energy cost from 22% to 15% of the Turn over

### DM

- Increase the Output / Input ratio (Yield) in the Pattern Plates
### Customer loyalty
Create new customer / markets

### Business excellence
Increase CAGR

### New value proposition
Be 3 years ahead of competition

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### Objectives

#### Company Objectives
- Reduce energy cost from 22% to 15% of the Turn over

#### Design and Implement an Energy Monitoring & Reporting System

**OTPM**

#### Design and Implement an Energy Monitoring & Reporting System
- **Guidelines**
  - As per plan:
    - May-08
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**OTPM**

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OTPM - Monitoring & Reporting systems

110 KV  33 KV  33KV
10500 KVA  9950 KVA  9850 KVA

Total demand - 30300 KVA

Energy Report
# E&T Pillar on Energy Management

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<td>Reduce the auxiliary energy consumption to 200 kWh / Ton of metallics</td>
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<td>Reduce the energy tariff by increasing the proportion of renewable energy usage</td>
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<tr>
<td>Reduce the energy tariff by improving the powerfactor</td>
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</tbody>
</table>

**E & T**

Imparting the knowledge on the energy conservation techniques

Comprehensive and systematic building of competencies through Competency-based Management

---

Brakes India, Foundry Integration of TPM & TQM Page 33
Identify the Competencies required for the project

<table>
<thead>
<tr>
<th>Competency Required</th>
<th>Pillar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Auditing</td>
<td>EM</td>
</tr>
<tr>
<td>Equipment Design</td>
<td>PM</td>
</tr>
<tr>
<td>Manufacturing System Engineering</td>
<td>KK</td>
</tr>
<tr>
<td>DOE / Process Optimization Technique</td>
<td>QM</td>
</tr>
<tr>
<td>Casting Methoding</td>
<td>DM</td>
</tr>
<tr>
<td>ERP Programming</td>
<td>OTPM</td>
</tr>
</tbody>
</table>
Overall Results
Energy cost as a % of Sales

![Graph showing energy cost as a percentage of sales from 2002-03 to 2008-09. The graph illustrates a decrease in energy cost over the years.]

- **Actual**
  - 2002-03: 24%
  - 2003-04: 21%
  - 2004-05: 18%
  - 2005-06: 15%
  - 2006-07: 12%
  - 2007-08: 12%
  - 2008-09: 12%

- **Target**
  - 2002-03: 24%
  - 2003-04: 21%
  - 2004-05: 18%
  - 2005-06: 15%
  - 2006-07: 12%
  - 2007-08: 12%
  - 2008-09: 12%
Effects of Integration of TPM & TQM

- Emerging “scale & substance” outfit
- Strong global foot-prints
- Quality embedded in BIF culture
- Improved product development process & innovation in technology
- Robust process management
- Increased awareness & participation of everyone.
- Improved morale and pride in work.
- Improved quality of work life.
- Empowerment and ownership.
- Transparency & trust in communication.
- Becoming a learning organisation.
- Improving customer satisfaction.
“Vision to innovate
Passion to perform”

Journey towards Excellence

Thank you