	<b>KIRLOSKAR EBARA PUMPS LTD.</b>	
	Application for TPM Award	

## 1. Company, Plant Profile

Kirloskar Ebara Pumps (KEPL) KEPL is a global leader in the manufacturing of special-purpose pumps & steam turbines. It is a joint venture of Kirloskar Brothers Limited (KBL), India and Ebara Corporation, Japan. Since the company's establishment in 1988, KEPL has crafted an impressive footprint in the pump and steam turbine manufacturing market globally.

Established in 1888, Kirloskar Brothers Ltd was one of the frontrunners of the Industrial Revolution in India. KBL started as a humble bicycle shop by Shri Laxmanrao Kirloskar and Shri. Ramuanna Kirloskar, which expanded into a multinational conglomerate within 130 years of operations.

Ebara Corporation is a multinational diversified conglomerate founded in 1918, with headquarters in Tokyo, Japan.

KEPL is in the business of design, manufacture and after sales service of API and non-API Centrifugal pumps and Steam Turbines. Functions like, Sales, Project Execution, Finance, Human Resource(HR), Engineering(Engg) and Purchase operate from Head Office in Pune, Maharashtra State. Company has sales and service offices at different locations and also operate through KBL and it's subsidiaries.

The manufacturing Plant of KEPL is in Kirloskarvadi, in Sangli District in Maharashtra State of India. The details of the Plant is as below. In addition to manufacturing functions, part of the support functions like Purchase and Engg also, are located in the Plant, for effective support and co-ordination with manufacturing functions.

Total Area – 41,000 sq.m.

Built-up Area – 12,000 sq.m including office and manufacturing area.

No of Employees – Total 450 nos, 220 on regular rolls and 230 on contract. This includes managerial and supervisory staff.

The management system of KEPL is certified to ISO 9001-2015, ISO 14001-2015 and ISO 45001-2018.


### Product Range

- Overhung and between bearing, Single and Multistage pumps, for various applications in Oil & Gas Sector and Process Industry
- Pumps for Boiler Feed, Circulating and Condensate extraction for Power applications
- Steam Drive Turbines for various applications

### Manufacturing Processes

- Machining
- Welding and Fabrication
- Assembly
- Product Testing
- Painting and Packing

The Plant machinery is maintained and managed by in-house Maintenance Department, with support of external agencies and equipment suppliers, where required.

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The company is managed by a team of professionals headed by Managing Director Ms. Rama Kirloskar. The manufacturing Plant is headed by Mr. Varadaraja Pai.

## 2. Milestones on the Journey of Manufacturing Excellence

The business performance of the organization was going through a stagnant condition during 2014-2017. Though high-end machines were available, the utilization of the machines was very low. With many machines over 20 years of age, major breakdowns were seriously hampering production.

After realizing the benefits of TPM, in KBL's Dewas Plant, to address the challenges and bring the organization to growth trajectory, KEPL decided to implement TPM with following goals,


- Increase Sales and Profit
- Improve equipment OEE and Utilization
- Ensure defect free Products
- Create a safer and healthy working environment
- Improve skill level of the organization's manpower

With the help of a consultant from Industry Forum, UK, implementation of TPM was kickstarted in May 2017, with a pilot project of 2 critical machines and establishing 4 TPM Pillars, namely, Autonomous Maintenance (AM), Planned Maintenance (PM), Focused Improvement (FI) and Training & Development (T&D).

A steering team was made consisting of senior management from the Plant under the direction of Plant Head. Cross functional Project teams were made for each Pillar. All Pillar team members, steering team and all senior managers were trained in TPM concepts and methodologies. We also developed key management indicators (KMI), Key performance indicators (KPI) and Key activity indicators (KAI) to monitor and measure the result of initiatives.

With active support of machine operators and supervisors, the pilot machines could achieve step 2 in one year. The breakdowns of the pilot machines reduced significantly, and condition of machines transformed. The success story with pilot machines developed enthusiasm with employees and management decided to roll out the TPM initiative to the entire plant in October 2018. The journey progressed further as below.

- All A class machines were included in the TPM initiative. Stepwise activities like initial deep cleaning, identification & correction of hard to access areas (HAA) and sources of contamination (SOC), formation of tentative standards etc. were carried out in AM pillar for each machine.
- Pillar teams made for pilot phase further expanded and remaining pillars implemented progressively by end 2019, except early management.
- FI team extended improvement activities capturing losses and loss cost of all machines and taken up various improvement projects for set up time reduction and eliminating other losses. Successful improvements were demonstrated to all through QC stories.
- Training on concepts and methodology of Early equipment management was conducted in multiple sessions to all team members. The principles were successfully applied in shop layout

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changes and new machine additions in 2019 and 2020, which helped in vertical start-up of new machines.

- QM Pillar identified areas for improving quality and initiated improvement projects, effectively utilizing QC story boards.
- Kaizen reward and recognition scheme was launched to boost morale of employees and to accelerate building kaizen culture in 2020.
- With increasing requirement of new product designs, Design team was integrated into TPM initiative, implementing Early Product Management (EM) Pillar in 2021, with intention of improving design and development process. With this, all 8 pillars are implemented.
- Systematic training was conducted to impart knowledge and practical skills, though a 10 days' TPM Instructors course and other training. To date, KEPL has 18 JIPM certified TPM instructors. Through the trained and certified instructors, all employees in the Plant and majority of employees in office were trained in TPM philosophy and techniques.

### 3. Benefits Achieved

- The improvements achieved were translated into clear business growth. The annual sales in last 2 years increased by 30% in 23-24 and 5% in 22-23, over previous years.
- Significant improvement could be achieved in OEE, Utilization, No.of M/C breakdowns, MTBF and savings due to implementation of big and small kaizens.


However, targeted improvement on on-time delivery, MTTR etc. could not be achieved due to various issues, like, complexity in approval of documentation from customer, higher lead time required by supplier, changes done by Customer during drawing approval stage, shortage of semi-conductors in the market, unavailability of required spare parts etc.

The intangible benefits were much more impressive. With the progress of TPM initiative, the machine operators started taking ownership of the machines and got deeply involved in day-to-day cleaning and maintenance activities. They actively got involved in analysis of machine breakdowns and implementing corrective actions. With very good involvement of employees in maintaining 5S in the shop, keeping the machines tidy, improving unsafe conditions and practices we are marching towards achieving manufacturing excellence.

### 4. Key of our Manufacturing Excellence





















The last five years of practice in TPM taught us very valuable lessons. It is clear that practicing TPM philosophy is necessary to achieve and sustain success. The following areas are the key areas for taking the organization to the next level.

- Develop and maintain “I operate, I maintain” culture to minimize downtime of machines - Implementation of TPM has helped to understand this concept. We will further nurture this concept and integrate in normal working.
- Predictive maintenance of the machines to avoid downtime – Sensing possible failure in advance can help in reducing downtime. Technologies like lubrication oil analysis is already deployed. Further techniques like vibration analysis, thermal imaging techniques etc. are also planned to improve predictive maintenance.

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- Effective spare part management of critical machines – Availability of spare parts is essential to improve MTTR. Critical spares and possible common spares are identified, and stocking policy is decided and implemented. Regular review is being done to refine the process.
- Improving skills of workers and Staff – Emphasis is given for multi-skilling of operators, training need identification and arranging required training. We have also planned to develop in-house trainers through train-the-trainer program. Competency assessment, gap identification and arranging training is ongoing process.
- Material balancing based on CDD - It's realized that delay in material balancing is a major issue we are facing leading to delays and increase in inventory. Various actions are ongoing to improve monitoring mechanisms to ensure material balancing based on CDD.
- Work center planning – Effective planning of work centers is necessary to ensure lowest production lead time. With increasing volume, manual planning became more difficult. Project to implement IOT based machine connectivity to capture real time data centrally is ongoing, which is expected to assist effective work center planning.
- Developing Suppliers – Delay and quality issues in bought out items are major challenges in our growth. Various actions are ongoing through Office and Quality Pillars.
- Effective co-ordination with Customer and KEPL functions to get timely approval of documents. We have realized delays in getting approval of documents leading to delay in execution. Improvement projects are initiated through Office Pillar, to ensure timely approvals.

## 5. Achievement Record

Category	Parameter	Unit	Better	Start of TPM	Actual 2023-24	Target for 2024-25	Trend
				2018-19			
Safety	Accident Frequency Rate	Ratio	↓	0	0	0	
Safety	Accident Severity Rate	Ratio	↓	0	0	0	
Safety	Safety Index	Index	↑	30	100	100	
Productivity	Machine Utilization	%	↑	62.4	75.4	85	
Productivity	OEE (Plant)	%	↑	47.8	54	68	
Productivity	Availability	%	↑	74	74	81	
Productivity	Performance Rate	%	↑	78	76	90	
Productivity	Quality Rate	%	↑	90	95	93	
Productivity	MTBF	Hours	↑	30.9	62.3	60	
Productivity	MTTR	Hours	↓	3.6	4.2	4.0	
Productivity	Number of breakdowns	Nos	↓	298	138	130	
Quality	Number of Customer complaints per unit	No per Unit	↓	0.17	0.06	0.06	
Quality	In-house rejection rate	ppm	↓	4323	668	1000	
Quality	In-house rework rate	%	↓	1.37	0.32	0.50	
Cost	Cost of poor Quality	% of Sales	↓	4.8	4.2	3.5	
Cost	Operating Expenses	% of Sales	↓	35.1	26.2	24.8	
Cost	Conversion Cost	% of Sales	↓	8.5	5.8	3.9	
Cost	Cost savings	Million INR	↑	0	4.9	5.0	
Delivery	Delivery performance	%	↑	25	39	90	
Moral	No. of Kaizens per employee per year	No / Employee	↑	0	2.4	2.5	
Other	Program where all employees can participate in TPM	All employees are encouraged to participate in TPM through various improvement projects undertaken.					
Other	Employee recognition for their achievement	Every month employees are awarded for their outstanding contribution. Awards are given for Best employee of the month,					
Other	Top management involvement in verification of completion of TPM pillar steps	Plant Top management attend all steering team meeting arranged to review progress of TPM implementation. Step audit also is being done by Top Management.					
Other	Display of Pillar activity board and review by Top Management	Display of Pillar activity board is established, and review is being done on monthly basis by TPM steering team, which include Plant top management.					

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