

**BEE's National Program**  
*on*  
**Energy Efficiency and Technology**  
**Up-gradation in SMEs**

**Ludhiana Forging Cluster**

**Baseline Energy Audit Report**  
**Mehram Industries**

*Submitted to*



*Submitted by*



**InsPIRE Network for Environment**

*September 2015*

# Contents

---

|   |           |
|---|-----------|
| <b>About The Project</b> .....  | <b>i</b>  |
| <b>Executive Summary</b> .....  | <b>ii</b> |
| <b>Chapter 1: Introduction</b> .....  | <b>1</b>  |
| 1.1 About the unit.....   | 1         |
| 1.2 Production Process of plant .....   | 2         |
| 1.3 Energy audit methodology.....   | 2         |
| <b>Chapter 2: Present Process, Observations and Proposed Technology</b> ..... | <b>4</b>  |
| 2.1 Special Purpose Machines (SPM).....                                       | 4         |
| 2.1.1 Present Process:.....   | 4         |
| 2.1.2 Observations.....   | 4         |
| 2.1.3 Conclusion .....  | 5         |
| 2.1.4 Cost Economics Analysis .....   | 5         |

## ANNEXES

|  |   |
|--|---|
| Annexure 1: Basic details and energy utilization pattern of M/s Mehran Industries..... | 7 |
| Annexure 2: Energy saving calculation for SPM machines – Turning Operation .....       | 8 |

## About The Project

---

The project BEE's National Program on "Energy Efficiency and Technology Up gradation in SMEs - Ludhiana Forging Cluster" supported by Bureau of Energy Efficiency (BEE), Ministry of MSME and Ludhiana Auto Parts Manufacturers Association aims to bring down the energy demand of forging industries located at Ludhiana by supporting them to implement Energy Efficient Technologies in the SME units.

# Executive Summary

## 1. Unit Details

|                 |   |   |
|-----------------|---|---|
| Unit Name       | : | <b>Mehram Industries</b>                          |
| Address         | : | Plot No. K-30, Phase-VII, Focal Point, Ludhiana   |
| Contact Person  | : | Smt. Surjeet Kaur (Cell No. 9878410234)           |
| Products        | : | BB Axle, Barrel Hinge, cycle and other auto parts |
| Production      | : | 500-700 Kgs                                       |
| DIC Number      | : | 030091103069                                      |
| Bank Details    | : | HDFC Bank, Account Number: 50200000569102         |
| TAN / PAN No.   | : | PAN: ACCPK4429M                                   |
| Contract demand | : | 78.61 kVA   |

## 2. Existing Major Energy Consuming Technology

### Lathes Machine

- ▶ Manually operated lathe machines for machining job work including threading, turning, grinding, drilling etc.
- ▶ Electrical motor rating of 3 HP with production of 130-150 pieces per hour per set of lathe machine.

## 3. Proposed Energy Saving Technologies with Cost Economics

### Proposed Energy Savings Measures

- ▶ Replacement of manual lathe machines by two numbers of CNC based Special Purpose Machine (SPM) for turning operation

Table 1: *Cost Economic Analysis*

| Technology                    | Estimated Energy Savings (%) | Savings        | Investment       | Simple Payback period (Years) |
|-------------------------------|------------------------------|----------------|------------------|-------------------------------|
| SPM - Turning Machine (2 Nos) | 83.9                         | 567,608        | 1,100,000        | 1.9                           |
| <b>Total</b>                  |                              | <b>567.608</b> | <b>1,100,000</b> |                               |

## Introduction

### 1.1 ABOUT THE UNIT

M/s Mehram Industries is engaged in manufacturing of different types of BB Axle, Barrel hinges, Cycle and other auto parts. The manufacturing unit is located at Plot No K-30, Phase –VIII, Focal Point, Ludhiana.

The raw material procured by the unit for making BB Axle, Barrel hinges, Cycle and other auto parts etc.

According to the assessment of the energy consumption data collected, the specific thermal energy consumption and specific electrical energy consumption is 0.37 L/kg (314.7 kcal/kg) of product and 0.15 kWh/kg (129.67) of product respectively. The total specific energy consumption (in kCal) is 314.7 kCal/ kg of product. Details of annual electrical and thermal energy consumption and specific energy consumption details in Mehran Industries are presented in table below:

Table 1.1: *Details of Mehran Industries*

| SN                        | Parameter   | Value   | Unit                 |
|---------------------------|---|---|----------------------|
| 1                         | Name and address of unit                                  | M/s. Mehram Industries                            |                      |
| 2                         | Contact person  | Mr. Amar Preet-9878410234                         |                      |
| 3                         | Manufacturing product                                     | BB Axle, Barrel Hinge, Cycle and other auto parts |                      |
| 4                         | Daily Production  | 500-700 bags                                      |                      |
| <b>Energy utilization</b> |   |   |                      |
| 5                         | Average monthly electrical energy consumption             | 9114  | kWh per month        |
| 6                         | Average monthly thermal (FO) energy consumption           | 0   | Liters per month     |
| 7                         | Average specific thermal energy consumption <sup>^1</sup> | 0   | Liter /kg of product |
|                           |   | 0   | kCal/kg of product   |
| 8                         | Specific electrical energy consumption <sup>^2</sup>      | 0.37  | kWh/Kg of product    |
|                           |   | 314.78  | kCal/kg of product   |
| 9                         | Specific energy consumption                               | 314.78  | kCal/kg of product   |
| 10                        | Electrical energy cost                                    | 2.75  | Rs/Kg of product     |
| 11                        | Thermal energy cost                                       | 0   | Rs/kg of product     |
| 12                        | Total energy cost   | 2.75  | Rs/kg of product     |

**Note:**

<sup>^1</sup>: Thermal equivalent for one unit of electricity is 860 kCal/kWh.

<sup>^2</sup>: The unit operates for 25 days a month (1 shift of 8 effective hours per day).

## 1.2 PRODUCTION PROCESS OF PLANT

The following figure shows the typical process employed at manufacturing of forged products at Mehran Industries are presented below:

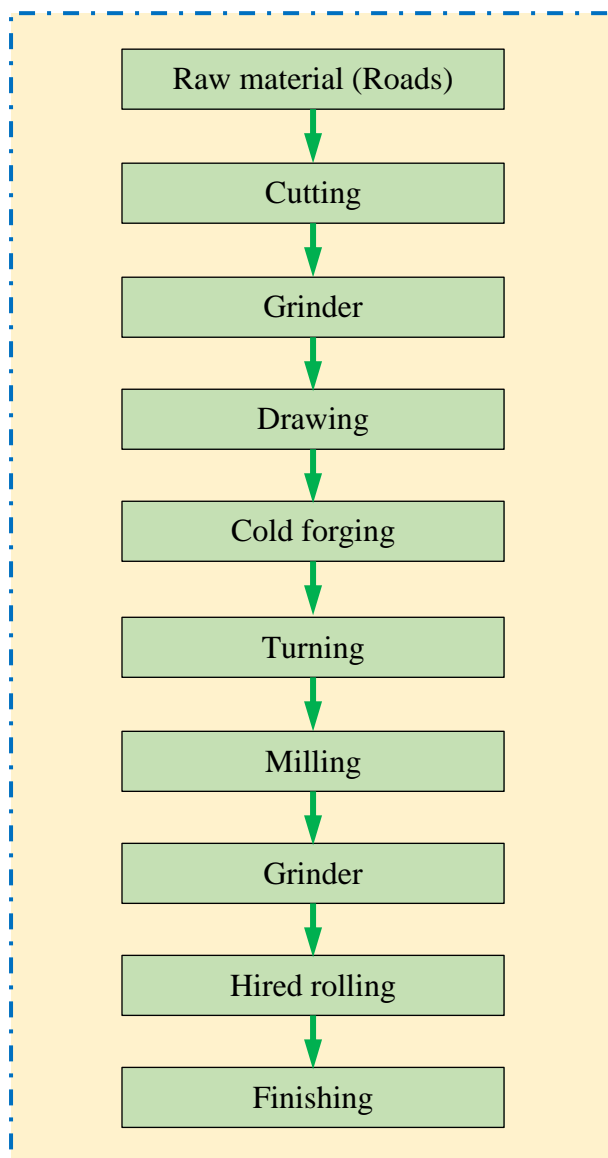


Figure 1.1: *Flow chart of the production process*

## 1.3 ENERGY AUDIT METHODOLOGY

The primary objective of the energy audit was to quantify the existing fuel consumption pattern and to determine the operating efficiencies of existing systems. The key points targeted through energy audits were determination of specific fuel consumption, various losses, operation practices like hot metal temperature, production, fuel consumption, scale formation etc. Pre - planned methodology was followed to conduct the energy audits. Data collected at all above steps was used to calculate various other operating parameters like material feeding rate (Kg/hr), fuel firing rate, specific fuel consumption (kg/tons), etc.

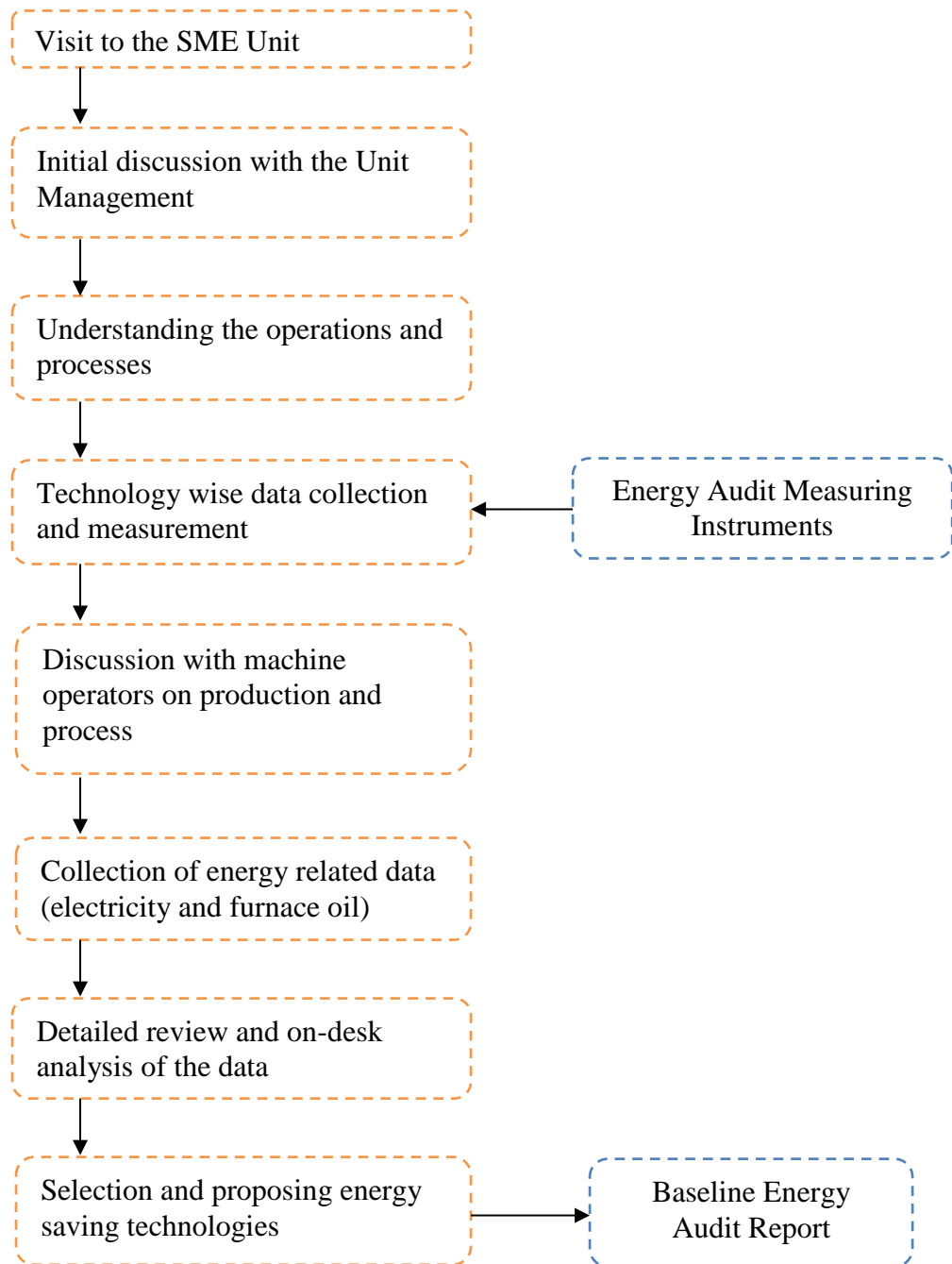


Figure 1.2: *Energy audit process*

## Present Process, Observations and Proposed Technology

### 2.1 SPECIAL PURPOSE MACHINES (SPM)

#### 2.1.1 Present Process:

Mehram Industries has installed manually operated lathe machines for various components machining job work like facing, turning, grinding, drilling etc. These machine runs on electrical motors having the capacity of 3 hp with production/ machining of 130-150 pcs/hr.



#### 2.1.2 Observations

Since these machines are manually operated, the process through which components are manufactured is very slow and time consuming. Apart from the slow process, the components manufactured are not very precise, identical and of high quality. Some times what happens that the machine keeps on running even there is no component on the machine or the operator is busy in some other work. All these factors lead to the loss of energy and production of low quality components.





### 2.1.3 Conclusion

In order to promote the energy efficiency and reduction in the overall energy cost in the factory, it is recommended to replace the existing manual machines by automatic special purpose machine (SPMs). Since the modified machines will run on the pre-installed programming technique, the consumption of electricity will only happen when there is a function or operation required on the component. In the ideal condition the machine will remain in dead mode/ no operation mode.

Apart from the operation, the machine automatically loads the component for machining. The cycle time of the each component will be fixed in the business logic of the PLC / SPM machine therefore each component will take specific time for processing or machining. The SPM machines results in 30-50% percent of the energy savings depending upon the type of component, operation, material, cycle time etc.

Benefits of the Automatic SPM/ CNC machines:

- Reduced energy consumption
- Faster operation and reduced down time
- Improved product quality and symmetrical product dimensions
- Higher productivity
- Environment friendly technology

### 2.1.4 Cost Economics Analysis

The comparison of production on old manual/ conventional lathe machine and modified SPM machine, specific energy consumption, cost savings, investment required and simple payback period of the investment on SPM machines is given in Table 2.2.

Table 2.2: *Cost Economic Analysis of Proposed SPM for turning operation*

| Parameter  | Unit    | Value   |
|--|---------|---------|
| Power consumed by conventional turning machine                           | kW      | 8.952   |
| Production on conventional turning machine                               | Pcs/hr  | 140     |
| Specific power consumption on conventional machine                       | kWh/Pcs | 0.064   |
| Power consumed by SPM turning machine (motor capacity 5HP) @ 80% Loading | kW      | 2.984   |
| Production on SPM turning machine (Projected)                            | Pcs/hr  | 290     |
| Specific power consumption on SPM machine                                | kWh/Pcs | 0.010   |
| Reduction in specific power consumption                                  | kWh/Pcs | 0.054   |
| Percentage savings   | %       | 83.9    |
| Operating hours  | Hrs     | 8       |
| Annual operating days  | Days    | 300     |
| Annual electricity savings   | kWh     | 37,343  |
| Annual cost savings  | Rs.     | 283,804 |
| Investment required  | Rs.     | 550,000 |
| Simple payback period  | Years   | 2       |

As per the detailed calculations done, it is proposed to convert existing manual lathes into automatic Special Purpose Machines (SPMs). The specific power consumption on a manual machine is 0.010 kWh/ pcs whereas the specific power consumption in modified SPM machine would be around 0.054 kWh/pcs resulting in 83.9 % savings in electrical energy. The investment required for making an SPM machine would be around Rs 5.5 Lakhs with annual saving of Rs. 2.83 Lakhs. The simple payback period of the technology is 2 years.

## Annexure 1

---

### Basic details and energy utilization pattern of M/s Mehran Industries

| Parameter   | Value   | Unit                 |
|---|---|----------------------|
| Name and address of unit                                  | M/s. Mehram Industries                            |                      |
| Contact person  | Mr. Amar Preet-9878410234                         |                      |
| Manufacturing product                                     | BB Axle, Barrel Hinge, Cycle and other auto parts |                      |
| Daily Production  | 500-700 bags                                      |                      |
| <b>Energy utilization</b>                                 |   |                      |
| Average monthly electrical energy consumption             | 9114  | kWh per month        |
| Average monthly thermal (FO) energy consumption           | 0   | Liters per month     |
| Average specific thermal energy consumption <sup>^1</sup> | 0   | Liter /kg of product |
|   | 0   | kCal/kg of product   |
| Specific electrical energy consumption <sup>^2</sup>      | 0.37  | kWh/Kg of product    |
|   | 314.78  | kCal/kg of product   |
| Specific energy consumption                               | 314.78  | kCal/kg of product   |
| Electrical energy cost                                    | 2.75  | Rs/Kg of product     |
| Thermal energy cost                                       | 0   | Rs/kg of product     |
| Total energy cost   | 2.75  | Rs/kg of product     |

**Note:**

<sup>^1</sup>: Thermal equivalent for one unit of electricity is 860 kCal/kWh.

<sup>^2</sup>: The unit operates for 25 days a month.

### Energy saving calculation for SPM machines – Turning Operation

| Parameter  | Unit    | Value   |
|--|---------|---------|
| Power consumed by conventional turning machine                           | kW      | 8.952   |
| Production on conventional turning machine                               | Pcs/hr  | 140     |
| Specific power consumption on conventional machine                       | kWh/Pcs | 0.064   |
| Power consumed by SPM turning machine (motor capacity 5HP) @ 80% Loading | kW      | 2.984   |
| Production on SPM turning machine (Projected)                            | Pcs/hr  | 290     |
| Specific power consumption on SPM machine                                | kWh/Pcs | 0.010   |
| Reduction in specific power consumption                                  | kWh/Pcs | 0.054   |
| Percentage savings   | %       | 83.9    |
| Operating hours  | Hrs     | 8       |
| Annual operating days  | Days    | 300     |
| Annual electricity savings   | kWh     | 37,343  |
| Annual cost savings  | Rs.     | 283,804 |
| Investment required  | Rs.     | 550,000 |
| Simple payback period  | Years   | 2       |

**Note:**

*\*\* The cost of SPM machines is an indicative value gathered from discussions with SPM machine suppliers. It may vary from operation to operation and product to product.*