

## Energy Conservation & Its Co-Related Environmental Issues In Bicycle Manufacturing Industries

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The present paper deals with energy conservation & its correlated environmental issues in bicycle manufacturing industries. The consumption of energy in various operations and their forms have been discussed. The associated environment problems alongwith their remedies have been discussed. The methodology of conservation of energy his various operations have been detailed out. Some new cleaner production philosophy and technology has been suggested.

### Introduction

Bicycle is considered as most energy efficient transport vehicle as it does not need any fossil fuel like Petrol or Diesel for its running. It works totally on human muscles. Hence, it does not create any Air Pollution and remains away from all environmental issues.

However, manufacturing of Bicycles involves huge amount of energy for different operations like:

- Welding / Brazing
- Painting
- Electroplating
- Heat Treatment
- Machining / Metal Forming, etc.

Following forms of Energy are consumed in Bicycle manufacturing:

- Electricity
- Furnace Oil/ Residual Furnace Oil
- Hi-speed Diesel
- Compressed Air
- High Pressure Steam

Due to heavy consumption of Residual Furnace Oil/ Furnace oil and Hi-speed Diesel Control of Air Pollution becomes critical. In addition, various baths & furnaces used for heat treatment, brazing & Electroplating also add to air Pollution & Water Pollution problem.

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As many of the State Governments are unable to provide continuous Electric supply to Industries it has become imperative for all Industries, particularly Bicycle manufacturing industries due to its need of uninterrupted power supply to Electroplating Plant, to have its own captive power generation. The required DG Sets further call for:

- Air Pollution Control Measures &
- Noise Pollution Control Measures.

## Power Requirement

In Bicycle manufacturing following areas of operations have major Power requirement.

S.N.	Area of Operation	Type of power	Remarks
1	Welding	Electricity	
2	Brazing	Diesel	
3	Machining	Electricity Compressed Air	
4	Heat Treatment/ Hardening	Electricity	Un-interrupted supply
5	Electroplating	Electricity Steam	
6	Painting	Electricity Compressed Air	
7	DG Sets	Diesel	
8	Boilers	RFO/FO/Diesel	

All major cycle manufacturing industries are in private sector in India, M/s Atlas Cycles, Hero Cycles, TI Cycles, etc. Bicycle is looked at as poor men vehicle in India and, hence, the cost of bicycle has to be kept at the lowest possible level. As such these industries have to work at a very low profit margin and have to solely depend on the volume of production. Hence, all such industries in India are surviving on high volume of production, un-like European Industries which survive on high a margin and medium volume production. Due to this reason Indian Bicycle Industries are still to adopt modern Cleaner Production (CP) Technologies. Hence, redressal of Environmental issues due to consumption of Fossil Fuel becomes critical. At the same time.

- Water Pollution Control
- Air Pollution Control &
- Noise Pollution Control

Become essential which calls for quantum expenditure by these industries.

## Power Consumption

And average size of Bicycle Industry producing around 2 to 4 Millions Bicycle per year consumes power as tabled below:

S.N.	Type of Power	Average Consumption in Rs per bicycle	Remarks
1	Electricity	15 - 20	Supplied by state Government & supplemented by captive Power Generation
2	RFO/ FO	7 – 12	Supplied by Refineries
3	HSD	18 - 25	Supplied by Refineries

As such average power consumption per bicycle is Rs. 40 to 55 approx.

## **Method Of Power Conservation**

Whatever best is done by in industries for economic power consumption; still, there is ample scope for power conservation. Some examples are as follows:

### **A. Electricity Conservation Used For Light And Air**

- Use of CFL Bulbs for lighting / use of Tube light in place of high wattage bulbs.
- Separate switch for each bulb and a habit of switching off when not needed.
- Use of good quality Fans that consume low wattage for more air delivery.
- Centralised Air Conditioning System, wherever applicable.
- Abolition of cabin system for Officers, as followed by MNCs.

### **B. Diesel Conservation In Furnaces Used For Heat Treatment & Brazing**

- Design of re-circulatory furnaces.
- Use of out-going flame for pre-heating.
- Effective heat shielding walls in furnaces.
- Automatic time and temperature control equipment for each furnace.
- Cleaning of burner nozzles periodically.
- Reduction in idle running of Furnaces.

### **C. Electricity Conservation In Welding/ Machining**

- Reduce idle working of machines.
- Use of Energy efficient welding and other machines.
- Use of trained Operators
- Installation of high quality transformers.

### **D. Diesel Conservation In Dg Sets**

- Use of DG Sets only when it is must.
- Planned distribution of power from DG Sets so as to use it at optimum utilization level. Low consumption of power from DG Sets results in high Diesel consumption KWH.
- To keep power factor as high as practicable.
- Regular preventive maintenance of DG Sets.
- Regular cleaning of Burner Nozzles.

### **E. Electricity And Steam Conservation In Electroplating**

- Electroplating operation should be done continuously round the clock without break as it involves lot of heating of many baths and quality problem as well.
- Hanger design should be such that power consumption per unit surface area is minimum this calls for different hangers for different type of components.
- Installation of Auto Temperature Controller in hot baths.

### **F. Electricity Conservation In Compressor**

- Selection of requisite specification (CFM) of compressor.
- Correct location of compressor.
- Leak proof distribution of compressed air.
- Energy efficient Motor for compressor.
- Effective Auto cut in compressor.

## Methods For Environment Preservation During Different Operations

### A. Light & Air

Normally no environmental issue is associated with Industrial light & air. However, use of Air conditioners has enormously increased. As CFC is used in Air conditioners and Refrigerators which is injurious to OZONE LAYER, environmental care need to be taken adequately. This Ozone layer protects us from deadly Ultra-Violet Rays of sun. Hence, depletion of this Ozone layer has to be reversed. Therefore industries has to ensure against leakage of CFC for Air conditioners and Refrigerators. It is worth nothing that lot of innovative CP work is still to be done in this field by Scientists and Technocrats as ideal substitute of CFC is still to be made commercially viable, economical and easily available.

### B. Heat Treatment & Brazing

#### Heat Treatment:

Bicycle trade is mostly using Cyaniding process for Case Hardening. Use of Sodium Cyanide (NaCN) result in to dangerous Water Pollution. This Cyanide Effluent has to be treated suitably in an Effluent Treatment Plant by dosing with.

- Sodium Hydroxide (NaOH)
- Sodium Hypochloride (NaOCl)  
Some Bicycle Industry like M/s Atlas Cycles have gone for GAS CARBURISING TECHNIQUE which is a cleaner technology and makes the process free from any water pollution problems.

#### Brazing

Brazing operation does not result in to Water Pollution but some amount of Fumes generated due to burning to Flux deteriorates the ambient air. These fumes have to be extracted out from the ambient to keep good working condition.

### C. Welding / Machining

Conventional welding / machining operations in Bicycle trade do not result any environmental issues except the cutting oil used in some of the machining process. These cutting oils call for Effluent Treatment in a proper Effluent Treatment Plant.

### D. Dg Sets

Operation of DG sets attracts two Environmental issues

- **Air Pollution:** Air Pollution Control Measures have to be installed as Fumes from burnt Diesel is expelled in Air through chimneys which contains lot of Hydrocarbons and suspended particulate matters.
- **Noise Pollution:** Acoustic lining/ enclosure is essential for DG Sets to reduce the noise level coming out of the room with in the specified norms as per the law of the land. This noise pollution is important for the hygiene of the persons working on & around DG Sets. Incidentally, this is relatively a newer chapter for Bicycle manufacturing industries for which they are still to gear up their resources and technology.

## E. Electroplating

Following types of Electroplating are prevalent in Bicycle trade.

- Zinc Plating
- Nickel & Chrome Plating

Both types of Electroplating result in to Water and Air Pollution and call for effective Effluent Treatment Plant (ETP) to detoxify Effluents with in specified limits prescribed by respective State Pollution Control Boards.

M/s Atlas Cycles, Sonapat had installed one of the most modern Effluent Treatment Plant at a Capital expenditure of Rs. 1 Crore and invest about Rs. 5 per Bicycle on effluent treatment. This plant was designed by National Productivity council, New Delhi and it is considered as one of the best Effluent Treatment Plants of Northern India in private sector.

To improve the ambient air **Wet Scrubber** also has to be installed on Acidic baths to dissolve Acidic Fumes emanating from it to the ambient. M/s Atlas has installed Wet Scrubber on its Pickling Plant. In Addition to it uses chemical technique to suppress production of fumes from its Acidic Tanks:

- **Mist Free** is used to suppress production of fumes from Chromic Acid Tank in Electroplating Plant.
- **Rodine** is used for suppressing fume formation from its Hydrochloric Acid bath.

## E. Boiler

Fossil Fuel like RFO/ FO or Diesel is normally used for running the Boiler. The chance of release of un-burned / partially burned Hydrocarbon in Air is very high due to use of such fuel. As such effective Air Pollution Control Measures are required to be installed to guard against Air Pollution.

## F. Compressors

Use of Compressor does not touch any major environmental issues. However, it attracts safety measures which are normally taken by all industries.

## Some New Cleaner Production (Cp) Philosophy And Technology.

In India many of the Bicycle parts, like:

- Handle
- Rim
- Chain wheel crank
- Hub
- Spoke
- Pedal

Are Nickel Chrome plated. It is well known that electroplating generates trade effluent containing low pH, cyanide & Chrome. It calls for installation of effective Effluent Treatment Plant and its effective running. It produces lot of un-desirable hazardous sludge also whose disposal is still an un-solved problem. Advanced Countries of Europe and America are substituting Electroplating by Painting. Indian masses are still not showing acceptance of Painting of above components for which Bicycle manufacturing industries have to go for a combined National Campaign.

Painting not only reduces Water Pollution load but is also decreases energy consumption per bicycle because electroplating needs 4 to 5 times more energy than painting. Hence, for energy conservation it is imperative to shift from electroplating.

## **Future Scope**

Consumption of Bicycle is not likely to reduce in future because at one hand it serves as a poor man's vehicle and the other hand it works as an exerciser for the affluent class. Availability of fossil fuel which is essential to run motorcycles and cars is not going to last for long unless a major breakthrough in fuel science is obtained. Bicycle will have its utility even in such an unfavourable situation. Hence, popularising the use of bicycle, as being done by government agencies in the Republic of China, is a must for

- Every conservation
- Containing water pollution &
- Reducing air pollution.

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