DESIGN OF FIXTURE FOR WIND MILL DOOR SEGMENT

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ABSTRACT: *Wind power is the use of air flow through wind turbines convert to mechanically power generators for electric power. Wind power, as an alternative to burning fossil fuels, is plentiful, renewable, widely distributed, clean, produces no greenhouse gas emissions during operation, consumes no water, and uses little land. The net effects on the environment are far less problematic than those of non-renewable power sources. Wind farms consist of many individual wind turbines which are connected to the electric power transmission network. Onshore wind is an inexpensive source of electric power, competitive with or in many places cheaper than coal or gas plants. Offshore wind is steadier and stronger than on land, and offshore farms have less visual impact, but construction and maintenance costs are considerably higher. Small onshore wind farms can feed some energy into the grid or provide electric power to isolated off-grid locations. There is a door at the bottom of the wind mill. In order to manufacture these doors lots of processes are required we have created a new design for the fixtures so that these processes can be done in lesser production time.*

Key Words: *Wind mill, Manufacture Door, Fixture, Production time.*

1. INTRODUCTION

WINDMILL DEFINITION:

The energy in the wind turns two or three propeller-like blades around a rotor. The rotor is connected to the main shaft, which spins a generator to create electricity. Wind is a form of solar energy and is a result of the uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and the rotation of the earth, The terms wind energy or wind power describe the process by which the wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into electricity.

Wind Turbine Principle

A wind turbine works on a simple principle. This animation shows how energy in the wind turns two or three propeller-like blades around a rotor. The rotor is connected to the main shaft, which spins a generator to create electricity. Wind turbines are mounted on a tower to capture the most energy. At 100 feet (30 meters) or more above ground, they can take advantage of faster and less turbulent wind. Wind turbines can be used to produce electricity for a single home or building, or they can be connected to an electricity grid (shown here) for more widespread electricity distribution. The wind turbine working principle is followed by engineers when generating power through the forces of nature. For it to work most efficiently and increase the up time made during high velocity windy conditions, it is essential to install a strong framework that not only covers the essentials of power generation, but can also reduce the effect of damage in case of strong currents.

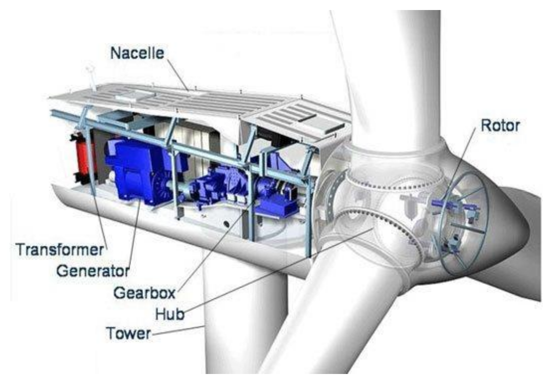

Fig. 1 Wind Turbines

Thus, there are certain guidelines that should be followed that are actually a formula of both the mechanics of the revolution process and the automatic reactions that are achieved through mechanical friction.

1.1 Working of Wind Turbines

Wind turbine converts wind power into mechanical energy, and then generator change it into electricity. There is a gearbox speeding up the rotation driven by wind power, and promoting the electricity production.

1.2 Uses Of Wind Energy

- Wind energy is used to move the sail boats in lakes, rivers and seas.

- It is used to operate water pumps.
- It is used to run the flour mill to grind the grains.
- It is also used to produce electricity.

1.3 Velocity Using For Wind Mill

- Rated power 2,000 kW (50/60 Hz).
- Cut-in wind speed 3 m/s.
- Rated wind speed 11.5 m/s.
- Cut-out wind speed 20 m/s.
- Wind class IEC IIIA.
- Operating temperature range: standard turbine: -20˚C to 40˚C.
- Low temperature turbine: -30˚C to 40˚C.

1.4 Importance Wind Mills

With the coming of the industrial revolution, the importance of wind and water as primary industrial energy sources declined and were eventually replaced by steam (in steam mills) and internal combustion engines, although windmills continued to be built in large numbers until late in the nineteenth centu

1.5 Application Of Wind Mill

Windmills can operate for six months or more without any maintenance or supervision. They operate in some of the worse environmental conditions imaginable; all seasons of the year, in temperature extremes, in lightning storms, snow storms, high summer humidity as well as in dry arid extremes.

This white paper recommends what I/O typically needs to be monitored and what controllers are best suited on a windmill in order to provide the safest and longest trouble-free operation. Moreover, due to the special environmental nature of the application, what signal conditioning hardware should be used to assure successful operation.

Table 1 Distribution Of Windmills Across India State wise

S. No	States/Uts	Installed
1.	Andhra Pradesh	6
2.	Assam	3
3.	Andaman &Nicobar	2
4.	Bihar	46
5.	Gujarat	819
6.	Karnataka	25
7.	Kerala	79
8.	Maharashtra	26
9.	Rajasthan	222
10.	Tamil Nadu	56
11.	A&N Islands	2
	TOTAL	**1284**

2. FIXTURES

- It is a work holding device that holds supports and locate the work piece and does not guide the tool for a specific operation
- The fixtures should be securely clamped to table of the machine upon which the work is done.
- Fixtures are special tools used particularly in milling machines, planners, shapers and slotting machines.
- Gauge block may be provided for effective handling.

2.1 Used for wind mill fixture

In fixtures for single components, only the spatial relationship between the process end-effector and the component with in Euclidean space is of critical importance. This is in contrast with fixtures for multiple components, where the system must constrain the every component within the assemblage relative to the process end-effector. Traditionally, dedicated single-component fixtures are designed to locate and hold a specific workpiece during a manufacturing process (e.g. machining, inspection).

2.2 Application for fixtures

A fixture is a work-holding or support device used in the manufacturing industry**.** Fixtures are used to securely locate (position in a specific location or orientation) and support the work, ensuring that all parts produced using the fixture will maintain conformity and interchangeability.

3. DOOR PREPARATION PROCESS

- Raw material cutting
- LSEP (Longitudinal Seem Edge Preparation) machining first side
- LSEP second side
- Rolling as per template
- Segment cutting
- Man hole cut out cutting
- CSEP (Circular Seem Edge Preparation) machining
- Drilling

- Grinding
- Punching
- Inspection
- Despatches

4. DESIGN OF FIXTURE

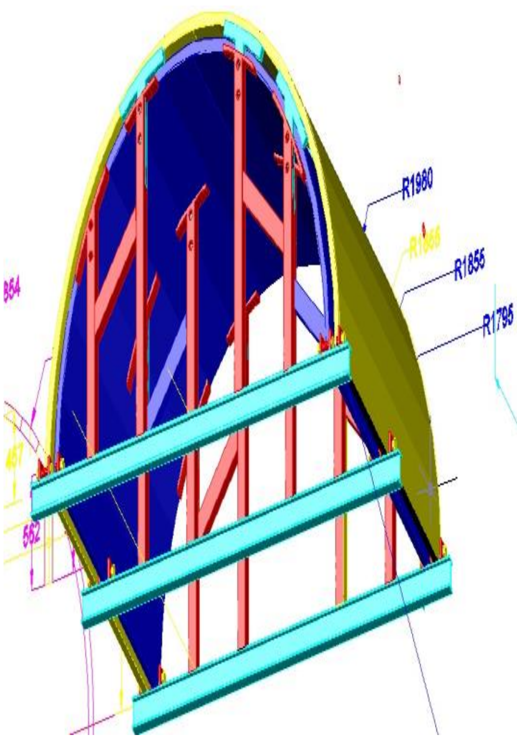

Fig. 2 Design of Fixtures

4.1Adjustable Clamp

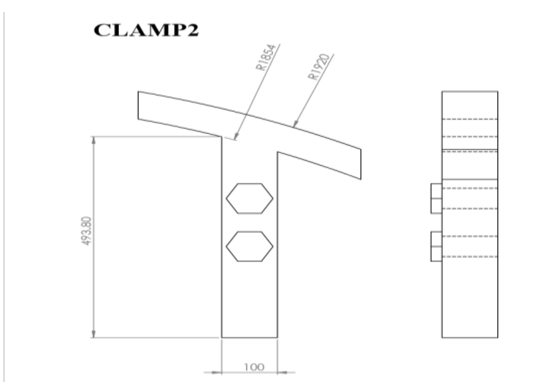

Fig. 3 Upper Clamp Height

Upper clamp height =499.80mm
Thickness = 100mm
Plate thickness = 50mm
Plate inner radius = 1854mm
Plate outer radius = 1920mm

4.2 Side Clamp Of Upper Side

Height = 555.56mm
Lower height= 460mm
Upper plate inner radius=1854mm
Upper plate outer radius= 1920

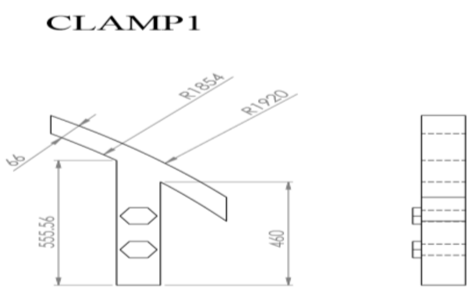

Fig. 4 Side Clamp

5. COST ESTIMATION

Section Beam

I section beam 1kg = Rs.70
Weight of 1m = 10 kg
Weight of 4m = 40 kg
I section beam = Rs.8400

C-Channel Of Centre position

1 kg of C-Channel = Rs.40
Weight of 1m = 5 kg
Weight of 2m = 10 kg
C-Channel cost = Rs.2400

C-Channel Of Side Position

1 kg of C-Channel = Rs.40
Weight of 1m = 5 kg
Weight of 1.5m = 7.5 kg
C-Channel cost = Rs.1800

Middle Clamp Of The Upper Position

1kg of upper middle clamp = Rs.70
6kg of upper middle clamp= Rs.350

Side Clamp Of The Upper Position

1kg of upper side clamp = Rs.70

Bolts And Nuts

Diameter of nut = 50mm

1 bolt and nut = Rs.25
30 bolts and nuts = Rs.750

Bold type – M12
Bolt Length – 110mm

Transport cost = Rs.1400

Electricity Cost

Electricity cost = Rs.7000

Labour Cost

Labour cost = Rs.4500

Prime Cost

$$\text{Primecost} = \left\{\begin{matrix}\text{Direct}\\ \text{labour}\\ \text{cost}\end{matrix}\right\} + \left\{\begin{matrix}\text{Direct}\\ \text{material}\\ \text{cost}\end{matrix}\right\} + \left\{\begin{matrix}\text{Allowance}\\ \text{of}\\ \text{material}\end{matrix}\right\}$$
$$= 4{,}500 + 23{,}850 + 1{,}400$$
$$= \text{Rs.}29{,}750$$

Standard Labour Cost time

Std. labour time =set up time + opearation time
=30+15
=45 mins.

Table 2. Requirement of Material

S. No	Materials	Quantity	Price
1	I-Section Beam	3	8,400
2	C-Channel Middle Position	6	2,400
3	C-Channel side position	6	1,800
4	Middle clamp for upper position	6	2,100
5	Side clamp for upper position	6	2,100
6	Bottom of the right side clamp	9	3,150
7	Bottom of the left side clamp	9	3,150
8	Bolts and nuts	30	750
Total			**Rs.23,850**

6. RESULT AND DISCUSSION

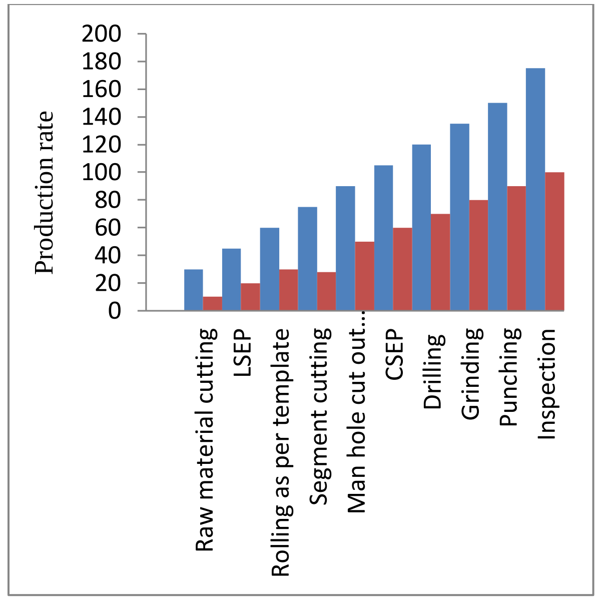

Fig 5. Existing Design

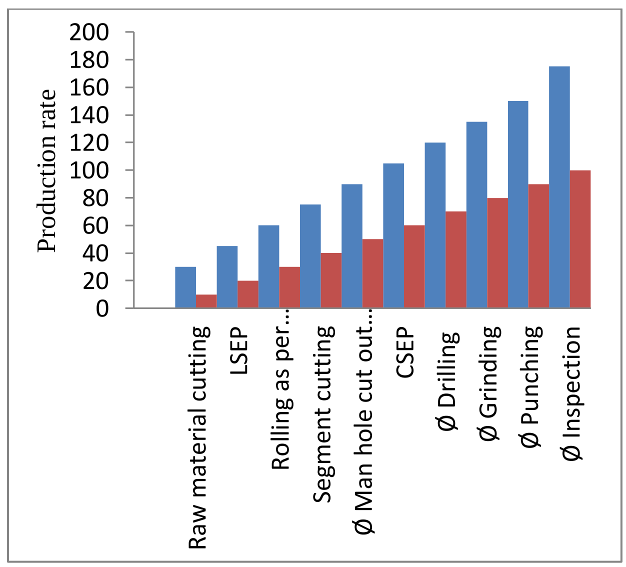

Fig 6. New Design

Table 3. Comparison Of Existing And New Design

S.No	Process	Existing Design Time(mins)	New Design Time(mins)
1	Raw material cutting	30	30
2	LSEP	30	30
3	Rolling as	45	45

	per template		
4	Segment cutting	45	28
5	Man hole cut out cutting	30	30
6	CSEP Machining	25	25
7	Drilling	20	20
8	Grinding	30	30
9	Punching	10	10
10	Inspection	20	20
11	Despatches	-	-
	Total	285	268

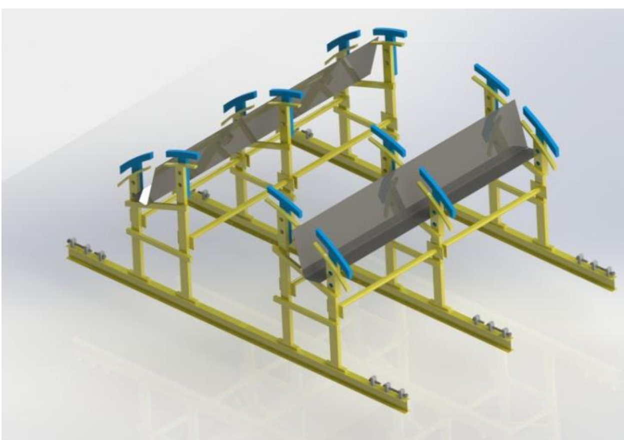

Fig 7. New Fixture Design

7. CONCLUSION

In wind mill tower production used two units. In first unit there are 12 process Raw material cutting, LSEP(longitudinal seam edge preparation) machining first side, LSEP second side, rolling as per template, segment cutting, man hole cut out cutting, CSEP (circular seam edge preparation) machining, drilling, grinding, punching, inspection, despatches Second unit there are 13 process. Plate receiving, CNC cutting, edge preparation, rolling, long seam welding, re-rolling, fit-up, circular seam welding, ultrasonic testing, block clearance, blasting, painting, despatches The influence of different material thicknesses at the tower lower parts. It investigates the lower tower section which includes the door opening which is used for service and maintenance inside the tower.

We have designed a new fixture for the fabrication of the wind mill door. From our design .

- Increase the production rate
- Reduce the number of labours required.
- Reduce working time (segment cutting)

From our designed fixture we can cut two plates at the same time for the model v100 and V110.

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