Replacing Single Spindle Drilling Machine with Semi/ Fully Automatic Multi Spindle Drilling Machine

Aurangabad Mixed MSME Cluster

Cluster Brief:

Aurangabad (Maharashtra) is a prominent MSME Cluster and houses about 1000 Auto parts Manufacturing MSME Units located in major industrial Areas Waluj – MIDC and some in outskirts of the city in industrial area like Chikalthana etc. The Auto Component Units in Aurangabad Cluster are principally known for rubber, metal and plastic components for auto and non- auto Sectors. Aurangabad has mainly metal, plastic, rubber component and tyre retread industries which caters to the auto OEM's like Bajaj Auto, Skoda Auto, Audi etc. and Non-auto like Siemens etc.

Deogiri Rubber Cluster Foundation is the local industry association having about 50 members industries from rubber sector. The association has formed one Common Facility Centre (CFC) for rubber mixing, which provides ready pre-mixed rubber as raw material to its member industries. The production capacity of the CFC is around 70 to 100 tons /day.

Pratishtan Forging Cluster Foundation is another local industry association managed by forging industries in Aurangabad with around 150 members. This association has also setup a CFC for Shot blasting, drawing, cutting and forging operations.

Present Technology:

Presently, MSME unit uses manually operated single spindle drilling machine to make hole / cavity in the metal section of the job. The said machine operates for 10 hours a day effectively and produces about 450 pieces a day. The rated motor capacity of the machine is noted to be 3 HP. Due to the increase orders from the customer; the unit faces issues due to the limited processing capacity. Although the same can be enhanced by installing multiple single drilling machines but that would lead to more energy consumption, more investment and high operational cost. Also the due to the limited availability or shortage of the manpower is becomes difficult of the units owner to deliver the orders in defined timelines.

The other limitation of the present technology is that it can drill up 22mm depth due to which the jobs has to be further processed on the CNC machine making the whole process costly, time and energy consuming and also labour intensive. A multi spindle drilling machine can be installed in order to conserve energy and resolve the manpower availability issues.

Proposed Energy Saving Technology:

Multi Spindle Drilling Machines are generally used for drilling number of holes simultaneous together. The proposed multi spindle drilling machine could have 2 to 8 spindles connected in a synchronized manner depending upon the profile of the product and the drilling depth. The machine can be operated by single operator and multiple pieces can be processed at a time. The capacity of the multi spindle drilling machine would be in the range of 8 HP – 10 HP. Multi spindle drilling machines will offer reduced specific energy consumption, with more production output and less dependency on manpower.

Justification of technology selection:

The proposed multi spindle drilling machine would offer multiple benefits to the MSME unit by way processing number pieces in one go. The said will bring down the energy consumption to the tune of 67% and will completely remove the requirement processing the jobs on CNC machine. The said machine will reduce the cycle time/ piece and also resolve the manpower shortage issue which is presently being faced by the industries in Aurangabad.

Energy & Monetary Saving:

The detailed energy savings calculations for Replacing Single Spindle Drilling Machine with Semi/ Fully Automatic Multi Spindle Drilling Machine (4 Spindle) is given in the table below.

As per the observations, the Specific Energy Consumption in present situation is noted to be 0.146 kVAh/ piece after considering the operation on single spindle drilling machine as well as on the CNC machine for the given job.

The estimated specific energy consumption on the multi spindle drilling machine is 0.048 kVAh.

Multi Spindle Drilling Machine in place of Single Spindle Drilling Machine		
Parameters	**Units**	**Values**
Electrical load of Single Spindle Drilling Machine	kVA	1.7
Production output	Pcs/Day	450
Operating Hours	Hrs/ Day	10
Specific Energy Consumption – Existing	kVAh /Pcs	0.038
CNC Machine Consumption	kVA	6.5
Production output	Pcs/Day	600
Operating Hours	Hrs/ Day	10
Specific Energy Consumption – Existing	kVAh /Pcs	0.108
Total SEC	kVAh /Pcs	0.146
Electrical Load of Multi Spindle Drilling Machine (4 Spindle)	kVA	6
Production output	Pcs/Day	2000
Operating Hours	Hrs/ Day	16
Specific Energy Consumption – New	kVAh /Pcs	0.048

Multi Spindle Drilling Machine in place of Single Spindle Drilling Machine		
Parameters	**Units**	**Values**
Specific Energy Savings	kVAh /Pcs	0.098
Percentage Savings	%	67%
Annual Energy Savings (for 300 annual operating days)	kVAh	58867
Annual Energy Cost Savings (Tariff Rate @ Rs. 9.6 / kWh)	In Rs.	565120
Manpower Savings	Nos.	4
Worker Wage Rate	Rs./Day/Man	500
Annual Manpower Cost Savings	Rs.	600000
Total Cost Savings	Rs.	1165120
Investment for Multi Spindle Drilling Machine	In Rs.	1500000
Payback in Years	Years	1.3

Based on the energy savings calculations, the annual electrical savings would approximately be 58867 kVAh annually (@ Rs. 9.6/ kVAh). The total cost savings calculated is Rs. 1165120/ year. The estimated technology installation cost is Rs. 15.0 Lakhs per installation; the simple payback period for the same would be nearly 1.3 years.

The benefits can be summarized as:

- 67 % reduction in energy consumption and reduced CO2 emissions
- Reduced cycle time
- Payback within 2 years
- Easy to operate

Replication Potential:

Based on the discussion with associations, unit owners and energy audits, it is estimated that the technology has a replication potential of about 30 Nos. Based on replication potential, the overall project benefits will be as follows:

Parameters	Units	Values
Annual electrical energy saving (1 unit)	kVAh/year	58867
Annual electrical energy saving (30 units)	kVAh/year	1766010
Annual CO2 emission saving (1 unit)[1]	tCO_2/yr	48.20
Annual CO_2 emission saving (30 Units)	tCO_2/yr	1448.1
Estimated investment in technology (1 unit)	Rs in Lakh	15
Estimated investment in technology (30 units)	Rs in Lakh	450
Total Investment	in million USD	0.60
Life time energy saving	GJ	63576
Life time CO_2 saving	tCO_2	14481

[1] CO_2 Emission: Electricity – 0.82 kg/kVAh

Availability of the Technology:

There are good many technology providers available in India and many of them have their base in Maharashtra. The following are the technology providers available in the cluster.

Name of the Supplier	Complete Address	Email Address and Contact Number
AB Automation	Block No. L – 235, MHADA Colony, Near AS Clusb, Tisgaon, Aurangabad - 431133	Ph: 91-9823237615 Email: ab.automation7@gmail.com
Subrto Tools	Plot No.1/2 Kh No 24/21 Village Nangli Sakrawati Indl. Area, Near Honda 2 Wheelers Service Station Najafgarh, New Delhi- 110043	Ph: 91-9891026133 Email: subrtotools@gmail.com
VS Enterprises	Plot No. 2-3, Nangla Industrial Area, Near Kela Godwon, Gazipur Road, Faridabad - 121001	Ph: 91-9953750350 Email: sanjaysharma441.ss@gmail.com

Effect on the process

This technology will reduce the energy demand, cycle time, delivery time and would increase the overall productivity of the MSME unit.

Reasons for unpopularity:

This technology has yet not penetrated the cluster because of the following reason:

- Less knowledge about the availability of the technology.
- Higher cost of the machine.
- Small scale units need helping hands for the demonstration of the technology