Singaporean Journal Scientific Research (SJSR)
ISSN: 2231 - 0061 Vol.3, No.1pp.118 - 120
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available at: : http://www.iaaet.org/sjsr

Problems and solutions for Saw in Granite Mineral Processing

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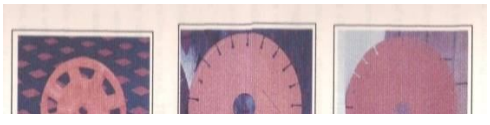
***Abstract* -Stone was conceptualized to upgrade the technology level of the Indian stone industry, develop international market for Indian stone and introduce the state of art in mining techniques with low environmental pollution.Dimensional stones form a major economic commodity in India. The current consumption of natural stones in india exceedsRs .1000 crores per annum.The stones sector also provides employment to over a million people. India is one of the few countries in the world processing a wide spectrum of dimensional stones viz, granite, marble, sand stone, limestone, quartz in the world market, in the Dimensional stones marketing. India has a market share of over 10% and it is the top exporter in sand stones. In the present paper it is proposed to study the various aspects like selection of tool, coolants, speeds, types of stones, machines, and possible causes and solutions during the stone machining processes. Also proposed to carry out the experiments on various stone machining machines by changing the various process parameters.A running –in period for a saw on any machine is considered quite nomal.thus it is necessary to take the first few cuts rather slowly and then gradually increase the cutting rate, which in turn increases the efficiency of the saw .an adequate cutting rate adversely effects the efficiency of the cutting layer, whereas an excessive rate leads to a tearing out of the individual diamonds from the bonding obviously, a blade meant to cut very hard materials needs a long running-in period.An adequate quality of coolant is of most important and must be fed accurately in to the area of contact the saw and the material to be cut. Clean cooling water preferably with coolant additives should be used to reduce the wear.**

1. INTRODUCTION

Of all the new methods for sawing slabs from quarry extracted blocks lime stone articles of industrial production ,the use of diamond blades mounted on frames undoubtedly results in the most economical process possible.The diamond blades are supplied both for horizontal and vertical frames . For single blade frames .the length of the blade depends on the dimensions of the frame .the thinness and height of the blade have a direct influence on the stability of the steel.It should be noted that with a greater blade thickness it is necessary to have larger segments. Consequently, a greater width requires more powerful motor and a heavier frame.The deferent types of diamond saws are shown in figure.



2. PERIPHERAL SPEEDS

Optimum peripheral speed is closely related to the hardness and abrasivity of the material to be cut, ideal selection will depend on the spindle speed, spindle drive output , saw diameter and specifications of the saw segments and will be definitely reflected in the cutting efficiency ?(or) the ultimate performance of the saw. There is thus no hard and fast rule for selecting the optimum speed. However in general low speeds of 20-30m/sec. should be satisfactory for hard materials like granite and limestone and 50-60 m/ sec. for relatively soft but abrasive materials like sandstone and alluvial stone. In other words the speed decreases as the hardness and compactness of the material to be cut increases.

3. RULES FOR SAW SELECTION

In selecting a circular saw for cutting stones, rocks, refractoriness or any other such materials, the following points must be carefully considered:

1. The material to be cut
2. Cutting quality and thickness desired
3. Service life of the saw desired
4. Machine characteristics

Problem	possible causes and solutions
Cut edges irregular	>check the blade side run-out
	>Check spindle radial run - out
	>And also the flange
	>Check the bearings flange block side run out
	>Check the flange Diameter
Cutting deviations	>make sure the work piece is held properly
	>Check Perpendicularity of the flange
	>Make sure the saw is sharpened
	>Confirm if the right saw is used for the material sawn.
	>Make sure the flange diameter is suited to the saw diameter
	>Check the peripheral speed
	>check out of parallelism
	>Reduced feed
Excessive laternal wear on segments	>Check traverse motion
	>check out for parallelism
	>check flange run-out
	>Check perpendicularity of the flange
	>Check flange diameter
	>Check spindle bearings
Steel blade rubs	>check out for parallelism
	>Check perpendicularity of the flange
Cracks in steel blade	>check out parallelism
	>should make drill holes at one end of the cracked position
	>check that the steel blades does not rub

Only after properly considering the above points , it is possible to correctly decides the saw dimension i.e., diameter, type of slot, segment thickness, and depth of diamond- impregnation and the segment specification .i.e., the bond diamond grit size and its concentration. Primarily the hardness and abrasibility of the stone (or) rock would decide the segment specifications. At the same time, however one must also consider whether the saw is to providing basically a high output (or) for a long life.

Service life for cutting saws naturally have a short life, since a softer bond and/or a lower concentration is used. This type of saw can be used satisfactorily only on sturdy and nearly vibration-free machines and that too at high peripheral speeds only ,conversely ,saws for a long service life must operate at low cutting rates and require higher drive outputs.

Machines susceptible to vibrations and having somewhat lower peripheral speeds could also be uses with such saws. Briefly a high cutting rate would result in high production output and also high cost of saws, but at the sometime low wages in contract. A long saw life would result in low production output and also low cost of saws, but correspondingl high wages and machine over heads obviously maximum economy can only be achieved by a judicious balancing of high cutting rate with a long blade life.

Table – 1 water as coolant

S.No.	Time consumed (min)	Power consumed (KWH)	Tool life
1. 2. 3. 4. 5. 6.	5 10 15 20 25 27	2.3 2.7 3.0 3.2 3.4 3.7	0.75 mm

Table – 2 (water+oil) as coolant

S.No.	Time consumed (min)	Power consumed (KWH)	Tool life
1. 2. 3. 4. 5.	5 10 15 20 25	2.2 2.6 2.9 3.1 3.3	**0.7**

4.HANDY TOOL USERS GUIDE

A. Do

1) Do always handle and store blades in a careful manner.
2) Do inspect the blade for shipping damage before mounting
3) Do umplug the power cord before mounting
4) Do mount properly
5) Do check the mounting flanges for equal and correct diameters.
6) Do check the mounting arrow marked on the blade against the direction of relation of the machine.
7) Do dial indication of the blade for less than 0.15mm.
8) Do use approved safety guards and goggles
9) Do dress by sawing abrasive material like

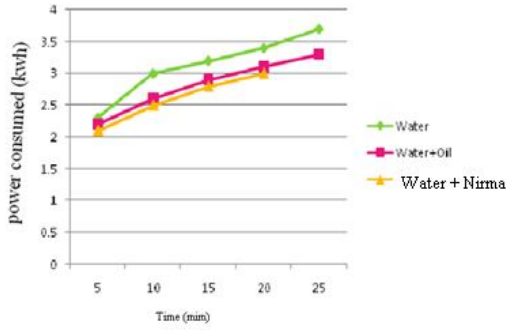
B. Do not

1) Do not use a cracked blade (or) one that has been dropped (or) damaged
2) Don't plug in the power cord while mounting
3) Don't use mounting flanges operating speed.
4) Don't exceed the maximum operating speed.
5) Don't force a blade on the machine (or) if the size of the mounting hole of a blade does not fit a machine. Get one that dose
6) Don't saw the diamond blade that is our truth the work and / or the blade may be damaged.

Table -3 (water++nirma) as coolant

S.No.	Time consumed (min)	Power consumed (KWH)	Tool life
1. 2. 3. 4.	5 10 15 19	2.1 2.5 2.8 3.0	 0.9

Graph is drawn for the above results on X-Y plot and is shown in figure 1



Time (min)

Figure1 Performance curve for various coolant used during machining of SRB using SBDT on 1.6-meter Dia Blade Machine

5. FROM THE ABOVE EXPERIMENTAL RESULTS, IT IS OBSERVED THAT

1. The tool life is 0.75 mm when the coolant is water 0.7 mm when the coolant is (water+oil) and 0.6 mm when the coolant is (water+oil+nirma)
2. The tool life is increased, when the coolant is (water+oil+nirma) as compared to (water+oil).the tool life is also high when the coolant is (water+oil) as compared to water only.
3. The time taken is 27 min to cut the piece when the coolant is water and 25 min in case of (water+oil) and 19 min incase (water+oil+nirma). Hence time taken to cut piece is in the decreasing order, when the coolant are water ,(water+oil) and (water+oil+nirma)

4. The power consumed is 3.7 KWH in case of water as coolant and 3.3 KWH

5. When the coolant is (water+oil) and 3.0 KWH when the coolant is (water+oil+nirma). Hence the power is

6. considerably reduced when the coolant is (water+oil+nirma) as compared to (water+oil).the power is also less when the coolant is(water+oil) as compared to water.

6.ANALYSIS OF PROCESS PARAMETERS

Machining the different materials (hard/soft) by using the two types of cutting tools (soft bond tool /hard bond tool) with water+oil+nirma as coolant on 1 meter diablade machine the tool life. Power consumed and time required to machine the material are shown in the table 4

Table 4

Type of material (mm)	Type of tool	Tool wear in mm	Power consumed KWH	Time consumed (min)
H.M	SBDT	0.75	4.5	32
H.M	HBDT	0.6	5.3	36
S.M	HBDT	0.5	4.7	34
S.M	SBDT	0.75	3.7	27

The following points are observed from the above four parameter combinations, when the coolant used is (water+oil+nirma).

1. The power consumed is very high in case of H.M. & HBDT. Combinations. And very less in s.m. &sbdt. Combinations.
2. The tool life is very high in S.M and HBDT.combinations.and less in S.M. and SBDT.combinations.
3. The time taken to cut the piece is very less in SM&SBDT. Combination.and very high in H.M.&HBDT.combinations.

7. CONCLUSIONS

This paper explore a study and analysis of process parameters in granite machining .the experiments are conducted on the machines by changing the parameters like coolants , MACHINES Dia of the blades ,Hardness ,Softness of the tool and raw material and observed the machining time and power consumed.

Experiment s are observed by taking three type of cooling mediaViz,water ,water +oil water +oil +nirma and changing the other parameters like Hardness /Softness of Rough block and hard /soft cutting tool material

The following conclusions are drawn from the experimental results

a) The time taken to cut the rough blocks is low in high viscous coolants as compared by to low viscous hence is machining time can be reduced by using high viscous coolants.
b) High viscous coolant result in low rubbing the power consumed is less as compared to low viscous coolants during machining hence the power can be saved by using high viscous coolants.
c) The tool life is increased by using high viscous coolants.
d) The tool lifes also high in machining soft material with hard bond diamond tool the time taken to cut the piece is very less in soft material & soft bond diamond tool combination.
e) The power consumed is very less in soft material & soft bond diamond tool combination.

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