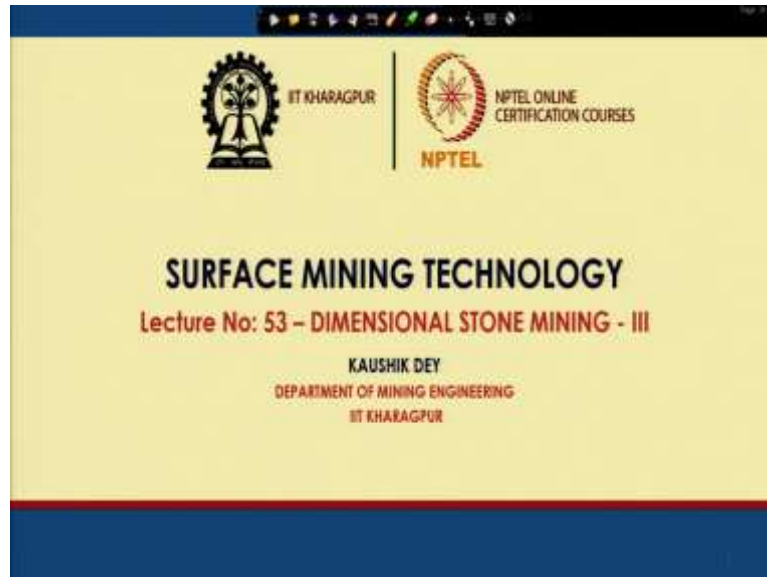


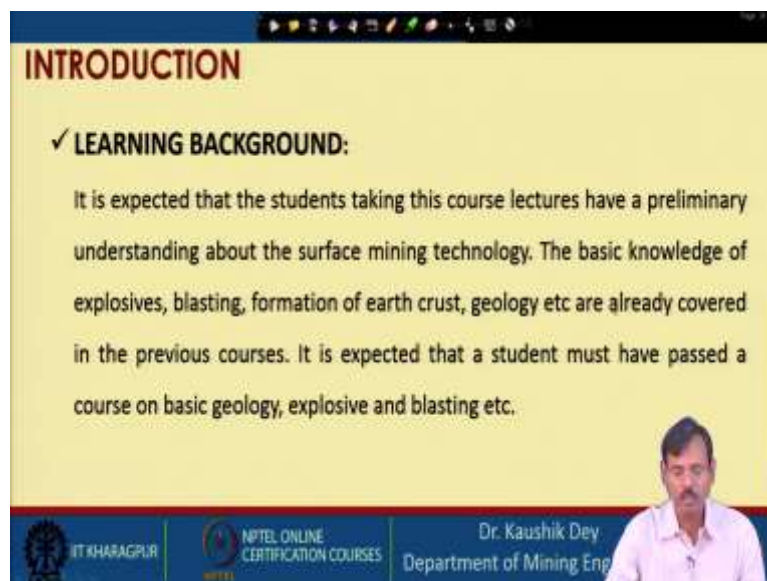
Surface Mining Technology
Professor Kaushik Dey
Department of Mining Engineering
Indian Institute of Technology Kharagpur
Lecture 53
Dimensional Stone Mining - III

(Refer Slide Time: 00:16)



Let me welcome you to the NPTEL online certification course of Surface Mining Technology. This is the third and final lecture on the Dimensional Stone Mining, we are continuing with the Dimensional Stone Mining Technology. This is the lecture number 53 of the surface mining technology course.

(Refer Slide Time: 00:41)



INTRODUCTION

✓ **Learning Objectives of This Course:**

- To know the different unit operations associated with surface mining.
- Methods of surface mining.
- Deployment of machineries in surface mining.
- Productivity analysis of surface mining.
- Safety and environmental control of surface mining operations.
- Special methods of surface mining.

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So like every lecture, let us once again have the glimpse of learning background required for Surface Mining Technology course in this NPTEL certification courses. This is these are the objectives of surface mining technology course.

(Refer Slide Time: 00:55)

INTRODUCTION

✓ **LEARNING OUTCOMES:**

It is expected that the students taking this course lectures will be able to envisage the surface mining operation and its technological nitty-gritty. It is expected that a student will be able to design the drilling and blasting rounds for surface blasting, will be able to choose, deploy and design the mine machineries for a set production target. The desired safety and environmental requirements will also be addressed.

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INTRODUCTION

✓ **LEARNING OUTCOMES:**

The student will also have an overall idea about the special methods of surface mining including sea bed mining, dimensional stone mining, highwall mining etc. The students will also able to deliver the technological and managerial requirements to the special safety requirements like slope stability and sump management etc.

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And this is the learning outcomes expected from the, from a participant of a, of this Surface Mining Technology course these are some of the more outcomes.

(Refer Slide Time: 01:11)

INTRODUCTION

✓ **SOME TEXT BOOKS AND REFERENCES**

1. Mishra G. B., 1978, Surface Mining, Dhanbad Publishers
2. Das S. K., 1998, Surface Mining Technology, Lovely Prakashan
3. Deshmukh R. T., 1996, Opencast Mining, M. Publications, Nagpur.
4. De Amithosh, 1995, Latest Development of Heavy Earth Moving Machinery, Annapurna Publishers
5. Hartman H. L., 2002, Introductory Mining Engineering, Publishers John Willey and sons

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INTRODUCTION

✓ **SOME TEXT BOOKS AND REFERENCES**

6. Peter Darling, 2011, SME Hand book, SME Publication
7. Rzhovsky, V. V., (1983), Opencast Mining Unit. Operation, Mir publications
8. Rzhovsky, V. V., (1985), Opencast Mining Technology and Integrated Mechanisations, Mir publications

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And these are some of the text books and references expected that students will follow these books and references.

(Refer Slide Time: 01:24)

INTRODUCTION

✓ **Retrospect Previous Lectures:**

In previous lectures, the phases of mining for extracting a deposit are discussed. The commencement of mining excavation through opening of box cut is discussed. The unit operations Drilling technology, Blasting technology, excavation and loading technology, Ripper, BWS, SM operations of shovel, surface miner, dragline, bucket wheel excavator etc are also discussed along with their pit layouts.

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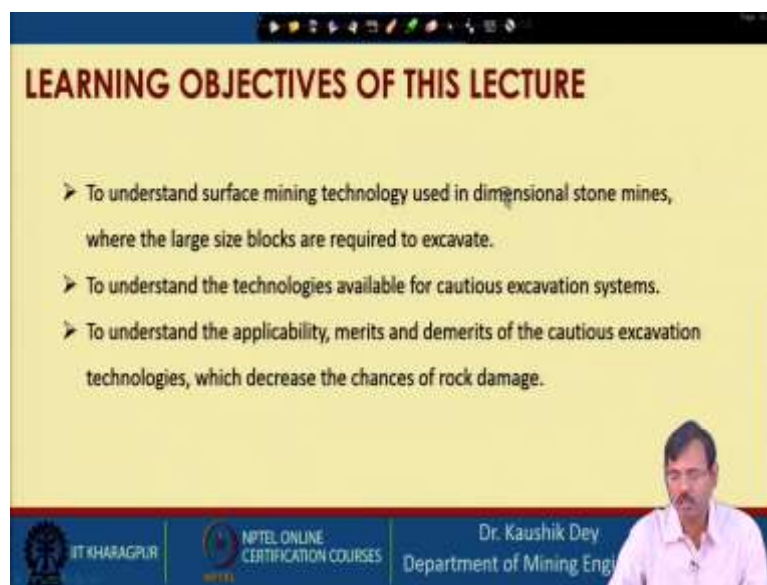
And let us retrospect whatever so far we have covered, so far we have covered the status of Surface Mining worldwide. We have covered the phases of mining and we have also covered the commencement of surface mining opening through a box cut. And we have covered the excavation technology drilling and blasting and blast free technologies like ripper, bucket wheel excavator, surface miner.

And these are basically for reduction of the size of the in situ rock mass so that that can be used by the excavators like Shovel front end loaders or sometimes drag line or stripping shovels which are used for direct casting or direct stripping of the material.

So those are already covered in this, we are continuing with dimensional stone mining and two lectures of dimensional stone mining is already covered. And in these two lectures, what is Dimensional Stone Mining and what are their importance what is the reserve status of the country and what are the production status of the country that is also discussed.

And in the second lectures, the mining excavation technique for the Dimensional Stone Mines are discussed, in which only the splitting part is covered during that. And we will continue with further cutting technologies required for Dimensional Stone Mining in this lecture.

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LEARNING OBJECTIVES OF THIS LECTURE

- To understand surface mining technology used in dimensional stone mines, where the large size blocks are required to excavate.
- To understand the technologies available for cautious excavation systems.
- To understand the applicability, merits and demerits of the cautious excavation technologies, which decrease the chances of rock damage.

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So objective of this lectures are to understand surface mining technology used in Dimensional Stone mines where the large size blocks are required to excavate. To understand the technologies available for cautious excavation systems, to understand the applicability merits and demerits of the cautious excavation technologies. So, these are the objectives for the Dimensional Stone Mining.

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DIMENSIONAL STONE MINING <https://www.youtube.com/watch?v=3t4t4t4t4t>



Fravizel

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This slide shows a large, rectangular stone block being processed in a quarry or industrial setting. The block is light-colored and appears to be being cut or shaped. The background shows a dark, industrial environment with some machinery and structures.

DIMENSIONAL STONE MINING <https://www.youtube.com/watch?v=3t4t4t4t4t>



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This slide shows a large, rectangular stone block being processed in a quarry or industrial setting. The block is light-colored and appears to be being cut or shaped. The background shows a dark, industrial environment with some machinery and structures.



So let us look into this video, where after splitting the pusher is used. So this is a pusher and that is why pushing technology, for pushing technology this video is there, how the material is pushed that can be easily understood using this, from this video. So after splitting how the pushing is carried out or after cutting how the pushing is made, you can see how the pushing is carried out.

See this block is placed so that that cannot be returned back. So that is why this block is placed at that position, see earlier a little bit splitting is done and a block rock block or wooden block is placed inside that so that it cannot return despite the movement.

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DIMENSIONAL STONE MINING <https://www.youtube.com/watch?v=g3m49K7gk>



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DIMENSIONAL STONE MINING <https://www.youtube.com/watch?v=g3m49K7gk>



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DIMENSIONAL STONE MINING <https://www.youtube.com/watch?v=g3m49K7gk>



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DIMENSIONAL STONE MINING <https://www.youtube.com/watch?v=g3m493Tgq>



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DIMENSIONAL STONE MINING <https://www.youtube.com/watch?v=g3m493Tgq>



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Now see earlier this one is using to hold this one now this one is using for holding this one. So more length can be pushed and that is why splitting can be carried out. Now this is allowed to fall down. So this is another pusher you can see, this rock is rock piece placed, now it is gradually being pushed either pneumatically or hydraulically or using a mechanical system, gear system.

See with this push it is now moved back and see this next block is placed at this position now, it is further pushed. Now the second block is placed at this position instead of this one now, the complete block is placed and now it is further pushed.

The benefit is that this assemble can be used along with a backhoe or excavator hydraulic excavator setup, in the mouth of the boom bucket has to be replaced with this system. And this has come as the attachment so it can be fixed with the boom and that can be used as the pusher.

So there is no additional excavation required for the machine only this much assembly is pushed. And the important part is that loose sand or soil is kept at this position to minimize the impact on the fallen block so that no cracks or minimum cracks will generate in this block, so that is the technology used in pushing.

(Refer Slide Time: 07:24)

CUTTING TECHNIQUES [Ashraf and Mohling, n.d.]

The techniques of cutting stone have been developed in relatively recent times.

Jet Flame Cutting: Jet flame cutting involves the use of diesel or paraffin with compressed air to produce a hot flame jet (around 25000 C) which spalds a channel in the stone.

Slot Drilling: Slot drilling involves the drilling of a coplanar line of large diameter (typically 64mm) holes at a centre to centre spacing of just less than twice the hole diameter using a line drilling rig to ensure accuracy.

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Now let us discuss the cutting technology, there are different cutting technology available. Jet flame cutting we have started with this because this is not very a popular one, say this the hot flame is generated, which cut the rock material or you can say melt the rock material and the make a channel in the stone, so that is a common technique where sometimes we go for coplanar slot drilling say diameter of 64 mm and they we keep, they do not have the spacing basically they are basically overlapped to each other like this so that a cut plane is created at that particular point.

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CUTTING TECHNIQUES [Ashraf and Mohling, n.d.]

- Slot drilling is now mainly utilised in the development of keycuts in soft sandstones, slates and marbles, as the drilling costs make it economically unviable in granites compared to alternative methods.

Initial holes drilled at spacing $= 2d$

Subsequent holes drilled to remove waste

Slot Drilling

No of Disks

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This is the second technology let us look into this figure, so this is the second technology in which subsequent holes are made keeping a spacing less than $2d$. So that the overlapping of

holes occurs so finally with this there is a cut plane generated at this line. So as this line cut plane is already obtained then this part can be pushed in the front direction. And that we can consider the block is already cut in two pieces. So by this way you can have a number of directional drilling and from that you can have the cut slots and by this way cutting can be achieved.

But this process, the main drawback are you need to go for very large drills large number of drilling large number of drilling, which is time consuming and tedious also. In fact, all the dimensional mining methods are tedious but despite that this is also tedious one and this is another problem that this is leaving a surface of rough like this so the polishing cost will increase for this surfaces.

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CUTTING TECHNIQUES (Aulmale and Mollburg, c.d.)

Diamond Wire Sawing

- 1 Horizontal and vertical holes drilled to intersect each other
- 2 Diamond wire passed through holes, joined into continuous loop around saw forkhead
- 3 Saw forkhead rotates to drive diamond wire, and saw moves back on rails to provide tension

Diamond Wire Sawing

Plunge cutting a blind cut with diamond wire.

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CUTTING TECHNIQUES (Aulmale and Mollburg, c.d.)

Diamond Wire Sawing:

- 1 Horizontal and vertical holes drilled to intersect each other
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Diamond Wire Sawing

Plunge cutting a blind cut with diamond wire.

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Then we have Diamond Wire Sawing this is very, very important and one can see these are the directional holes. Suppose one block is there, suppose this is the bench and a block of this one is required to excavate, this block is required to excavate. So if we are looking at this we have to excavate a block like this, this is the plan view we are looking at.

And for this what we need to do we have to carry out a drilling at this position and this position just like this one and this is the Diamond Wire Saw. So if you are looking at this, this is the Diamond Wire Saw, so this one is the Diamond Wire, this part is already cut, this part is required to cut. And this is the motor which is allowing the rotation of this one and this is the where this pulley is provided for directing this at this position.

This pulley is allowing the rotation of this one and from this to these it was the wire: was initially at this position and with the cutting it became like this and finally it will become like this. So by this way we can generate a cut area up to this in this line at this position. Similarly, the same thing can be carried out in the front direction also basically for this face.

And in that case, this one is the front direction, we are talking about cutting this one. So this hole will be utilized, this is the free area and this (port) in this line, the cutting can be made in a similar way, similarly in this area also cutting can be made in similar way. So you can consider your position is like this, let us consider the hole and we are cutting at this position.

So if you are taking the plan view of that one, if taking the sectional view of this one, then our section is let me clear the complete part, our section will be, so we have to place one pulley at this position and this portion we do not need any hole. So you can have one pulley directly you can have the machine at this position and this is the pulley allowed to work here but this hole is not required because this is the free face. So by this way you can cut the complete material and we can excavate the cut the complete direction except the bottom part.


In fact, bottom part can also be drilled if a horizontal drilling is carried out like this in the bottom part then also that is possible. But, often it is not required after cutting this one, if this is pushed then this will be moved in the front direction. So that is a common technology used for this cutting.

(Refer Slide Time: 14:54)

CUTTING TECHNIQUES (YouTube) <https://www.youtube.com/watch?v=9F1AFNaE6ak&t=17s>

Diamond Wire Sawing:

Concrete Cutting with Diamond Wire Saw



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CUTTING TECHNIQUES (YouTube) <https://www.youtube.com/watch?v=9F1AFNaE6ak&t=17s>

Diamond Wire Sawing:



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CUTTING TECHNIQUES (YouTube) <https://www.youtube.com/watch?v=9F1AFNaE6ak&t=17s>

Diamond Wire Sawing:

Diamond wire saw machine



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CUTTING TECHNIQUES (YouTube) [https://www.youtube.com/watch?v=PMNaE6a8t=52%](https://www.youtube.com/watch?v=PMNaE6a8t=52%3A)

Diamond Wire Sawing:

Core a hole to loop the diamond wire around the concrete structure.

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CUTTING TECHNIQUES (YouTube) [https://www.youtube.com/watch?v=PMNaE6a8t=52%](https://www.youtube.com/watch?v=PMNaE6a8t=52%3A)

Diamond Wire Sawing:

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CUTTING TECHNIQUES (YouTube) [https://www.youtube.com/watch?v=PMNaE6a8t=52%](https://www.youtube.com/watch?v=PMNaE6a8t=52%3A)

Diamond Wire Sawing:

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Let us look into one such video. This is a concrete cutting video where the Diamond Wire Saw is used for cutting a concrete, so this portion is required. See this is the Diamond Saw Wire saw, so the Diamond Wire Saw started cutting the concrete. Obviously, always the water has to be placed to reduce the temperature of the frame, so this part is being cut so this platform is being cut, so Diamond Wire Saw is cutting this one, this is a concrete platform.

(Refer Slide Time: 16:08)

The image displays two sequential screenshots from a YouTube video titled "CUTTING TECHNIQUES". Both screenshots feature a video player interface with a URL: <https://www.youtube.com/watch?v=9JAI1NaE6sk>. The video content is labeled "Diamond Wire Sawing:". The top screenshot shows a close-up of a diamond wire saw cutting through a concrete platform, with water being applied to the cut. The bottom screenshot shows workers in safety gear operating the diamond wire saw on a large, dark structure. Both screenshots include a small inset of Dr. Kaushik Dey, Department of Mining Engineering, IIT Kharagpur, and NPTEL Online Certification Courses.

CUTTING TECHNIQUES (YouTube) <https://www.youtube.com/watch?v=yP1AFNaVEa8>

Diamond Wire Sawing:



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CUTTING TECHNIQUES (YouTube) <https://www.youtube.com/watch?v=yP1AFNaVEa8>

Diamond Wire Sawing:



Slings are installed.

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CUTTING TECHNIQUES (YouTube) <https://www.youtube.com/watch?v=yP1AFNaVEa8>

Diamond Wire Sawing:



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The benefit of the Diamond Wire Saw is that it can be applicable to any shape and applicable to any dimension only the length of the wire is required to cover that part. That is the benefit of this one with a very little bit of few numbers of slot hole Diamond Wire Saw can be easily used and that can already you can see the cut surface is already made.

So this portion is already cut from this, they are also now started cutting this one, this portion is already cut. So that is why for holding this one, chain is provided and they are now cutting this one and that is why see this block is now cut so that can be removed very easily.

(Refer Slide Time: 17:14)





So the benefit of this one is that this can be used for any dimension, this can be used for any dimension, any length any shape that is the great benefit of this Diamond Wire Sawing. So dimension, length, shape all these are, there is no restriction on this and these are applicable for all those conditions.

Only the main drawback is that diamond wire is itself very costly and it is also a slow process but that is also benefit that the proper safety precautions can be taken for during this cutting process so that is the benefit of this one.

(Refer Slide Time: 18:02)

CUTTING TECHNIQUES [Ashraf and Mokong, s.d.]

Diamond Wire Sawing: Using this method, two holes are drilled to intersect each other, commonly over distances of up to 25 metres and vertical height of 6 to 12 metres. The diamond wire is then passed through these holes and joined to form a continuous loop, which is placed over the flywheel of the saw. Current sawing rates achieved are of the order of 2-4 m²/hr in granites and up to 10 m²/hr in marbles.

Water Jet Cutting: Machines have also been developed for cutting the stone loose with high-pressure water jets using suspended abrasives and while these are technically feasible, their high capital costs and long set-up times make them economically unviable in most quarry configurations.

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CUTTING TECHNIQUES [Ashraf and Mokong, s.d.]

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So diamond wire sawing; using this method two holes are drilled to intersect each other commonly over a distance up to 25 meters 6 to 12 meters also. Diamond Wire then pass through these holes joint to form a continuous loop which is placed over the flywheel of the saw and the sawing, currently the sawing rate of 2 to 4 meter square that is the cut area new cut area obtained per hour is achieved in granite and 10 meter square per hour is achieved in marbles, that is observed, this is the reference of the same.

So that is why it is a very, very popular and useful technology for dimensional stone mining. So everywhere, this is basically welcome and these are used. Water jet cutting is basically a hydraulic process where the water jet is high pressure jet water jet is provided and these are

feasible with high capital cost long setup times make them economically unviable in most of the queries.

So though this technology is possible where water jet is used to drill a hole or delay, in fact, one video is shown in the drilling and blasting technology lecture for use of water jet for creating the hole. So water jet cutting video is also available there, so that is shown there, but this technology is not very popular not very viable technology. So that is not used in most of the cases.

(Refer Slide Time: 20:01)

CUTTING TECHNIQUES

(Ashraf and Motloug, 2011)

Chain Cutters: Chain cutters make use of a jib of approximately up to 8m in length on which runs a chain fitted with tungsten carbide tipped picks. The machine cuts a slot of approximately 100m in width, 8m in depth, and length limited only by the setup of the rails on which the machines travel. These cutters are used mainly in marble and limestone quarries.

(YouTube)

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And Chain Cutter is another important technology which has a jib approximately up to 8 meter commercially available, these are processes with tungsten carbide tip picks. So this machine cuts the slot approximate 100 meter width 8 meter width sorry 10 meter width 8 meter depth and a length limited only by the setup.


And that can be so, that is the setup length so that can be made by these cutters very easily and very commonly used on the marble and the stone queries this type of cutters because their pricings are not very significant.

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CUTTING TECHNIQUES

(Ashraf and Motloung, n.d.)
(YouTube)

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CUTTING TECHNIQUES

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CUTTING TECHNIQUES

[Ashrafi and Motloung, 2016]

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(YouTube)



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CUTTING TECHNIQUES

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(YouTube)



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CUTTING TECHNIQUES

[Ashrafi and Motloung, 2016]

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(YouTube)



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CUTTING TECHNIQUES (Ashraf and Motloug, 1981) (YouTube)

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CUTTING TECHNIQUES (Ashraf and Motloug, 1981) (YouTube)

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So this is one small video, where this Chain Cutter machine is mounted on this block it is allowed to slide on this. And you can see this Chain Cutter where the tungsten carbide tips are there. And this is the motor which is allowing the rotation of the tungsten carbide tip. And this is the previously cut surface on the stone block, these are only allowed to push from this.

And these are the hydraulic controls of the block which is allowing the control over the position of the jib. And this is the motor which is allowing the rotation of the chain on the jib so the chain is very, very important here, see this chain is very, very important which is having the tungsten carbide tips over this. So this chain is very, very important.

The role of this chain you can see, the chain is cutting this one and one part is very, very important while it is cutting it is always wished that this must be a water assisted cutting so

that the temperature of the tungsten carbide tip can be maintained. And there should not be any distortion on that.

So if we cannot cool down this chip, then the tungsten carbide tip will be lost and then the cutting efficiency will be reduced significantly. And these are the sludges, which is coming out after the cutting and this has to be removed on regular basis so that it will not again push down into the cut area. So these are the important aspect must be controlled during the chain cutting of the saw.

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CUTTING TECHNIQUES [Ashmole and Moklong, n.d.]

Diamond Belt Cutters: Diamond belt cutters operate on the same principle as chain cutters, but have a rubber belt fitted with diamond segments instead of the toothed chain. They are also used mainly on softer stones such as marble and limestone.

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This slide features a yellow background with a blue header. The title 'CUTTING TECHNIQUES' is in bold red text. The main text is in blue and black, with key phrases underlined. A small inset photo of Dr. Kaushik Dey is in the bottom right corner. The footer contains logos for IT Kharagpur and NPTEL, along with the speaker's name and department.

CUTTING TECHNIQUES [Ashmole and Moklong, n.d.]

Giant Disc Saw Cutters:

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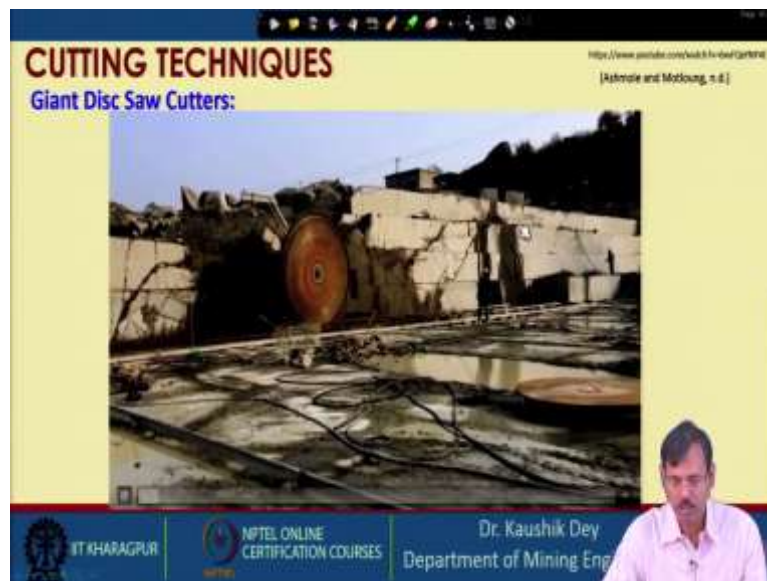
This slide features a yellow background with a blue header. The title 'CUTTING TECHNIQUES' is in bold red text. Below the title is a photograph of a large industrial disc saw cutting a stone block. A small inset photo of Dr. Kaushik Dey is in the bottom right corner. The footer contains logos for IT Kharagpur and NPTEL, along with the speaker's name and department.

Then we are having diamond belt cutter similarly, the diamond belt cutters operate on the same principle of the Chain Cutter, same principle of Chain Cutter, it has a rubber belt fitted

with the diamond segments instead of a tooth chain and they are also used mainly on the softer stones such as marble and lime stones.

So in those cases, in general these are used because granite is having a high consumption of the tip. So that is why it is in general avoided the use of this chainsaw in the hard formation. And this one is the giant disk saw, we have already seen one such application and this is another application from a marble query so we can look into this first let us look into the video of the same.

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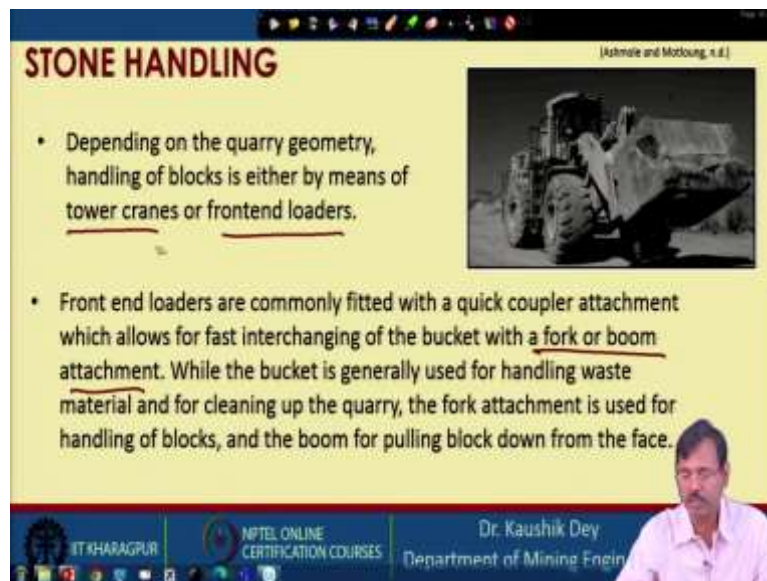
See this is the Giant Saw and this Giant Saw is controlled by this machine, now this Giant Saw is rotating, this Giant Saw is rotating and it is started cutting the rock. So this is in situ rock mass, these are the benches and in this bench the Giant Saw is allowed to cut the floor or create a cut line on the floor it is the better way to describe it.

See it is already lowered a lot, a good portion is already cut, one is the limitations there with all disk cutters that the cutting depth is restricted to the half of the diameter or less than the half of the diameter of the disc. Because in that part we are having the motor to rotate the machine so the cut depth is restricted to the half of the diameter, that is the maximum possible or close to the half of the diameter of the disc.

So this is very easily observed that the disc has cut a good portion of the floor and create an opening there, so slot is prepared at this position. So this is also you can see water assisted as it is in the floor, so that is why water is placed, that water is acting as a flushing media also, water is also cooling down the tips of the disc cutter.

So water is very, very essential for the disc cutting in fact for all the cutting technologies used in the Dimensional Stone water spraying is mandatory for all these cases. So this is the giant disk cutting system and so it is moving gradually towards that side so horizontally also it is moving.

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STONE HANDLING (Ashraf and Motloug, n.d.)

- Depending on the quarry geometry, handling of blocks is either by means of tower cranes or frontend loaders.
- Front end loaders are commonly fitted with a quick coupler attachment which allows for fast interchanging of the bucket with a fork or boom attachment. While the bucket is generally used for handling waste material and for cleaning up the quarry, the fork attachment is used for handling of blocks, and the boom for pulling block down from the face.

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Now this is the way of Stone Handling, we have already seen in the video, generally a scissor lift is used or we have to use tower cranes, front end loaders or scissor lifts, these are the common equipments used to handle this blocks. And these are with the fork and boom attachment, these are used and the cautious handling is very, very important. So we have seen video related to this.

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STONE HANDLING (Ashraf and Motloug, n.d.)

- Hydraulic excavators are widely used in dimension stone mining, both for the removal of overburden, as well as within the quarry itself to pull or push split blocks off the face.
- Transport of waste material to the waste dump is now carried out by the dump truck.

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And generally transporting is carried out with a trailer system or the dumper system. But generally it is not allowed the material will be dumped from the dumper, it is allowed either if it is dumped, then it has to be dumped on a sand dome and or it has to be taken out from the dumper by a crane. So that is the general provisions

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CHOICE OF MINING METHOD

[Ashraf and Moklung, n.d.]

- The choice of mining method in a dimension stone quarry is largely affected by the geology of the deposit. Boulder formations will largely be quarried by means of splitting methods, especially by means of the use of blasting gunpowder, while solid formations will require the at least some application of one or more cutting methods in order to loosen large benches from the solid formation.
- In general, in marbles, slates, sandstones and quartzites mining will be by non-explosive splitting and cutting techniques, while in granites blasting techniques may be applied.


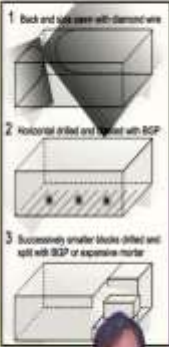


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CHOICE OF MINING METHOD

[Ashraf and Moklung, n.d.]

- The physical properties of the stone are likely to determine what type of explosives will be applied. In stones without prominent cleavage directions, the high VOD explosives are often very successful and economic in splitting the stone, while Gun powder is often the favoured explosive in cases where the cleavage is prominent.
- Conventional mining of solid formations of marble and granite will make use of diamond wire sawing to loosen large benches, which are then split into successively smaller blocks until these are of a size that can be handled by the loader or crane.



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CHOICE OF MINING METHOD

[Ashraf and Moklung, n.d.]



Subsurface quarrying in solid formation (Emerald Pearl Quarry, Norway)



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And it is up to this, the techno economic analysis must be carried out prior to choose the mining method which are already shown here. Use of blasting is mostly prohibited; this is the view of on Emerald Mines of Norway.

(Refer Slide Time: 29:21)



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FINAL REMARKS

- The dimension stone industry is relatively large in value when compared to non-fuel minerals, and consumption of natural stone is growing a rate significantly faster than most mineral products.
- While in the past, quarrying of dimension stone was carried out by traditional methods developed over many centuries. Now a days technologies are developed based on geology and many branches of mining engineering, ranging through blasting technology, non-explosive rock breaking, rock mechanics, mine design and scheduling, geostatistics and reserve evaluation.

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These are the references and dimensional stone mining is very, very large in value in compared to the other mining systems, but it has to be required cautious excavation system. So that is the end of the Dimensional Stone Mining. Thank you.