

MINERAL EXPLORATION:

Drilling methods and technical solutions

A presentation by Silvia Azzoni
Massenza Drilling Rigs



DRILLING METHODS

SEVERAL SOLUTIONS - ONE GOAL



Hollow Stem
Auger Drilling



Reverse
Circulation
Drilling



Core Drilling

HOLLOW STEM AUGER DRILLING

DRILLING METHOD

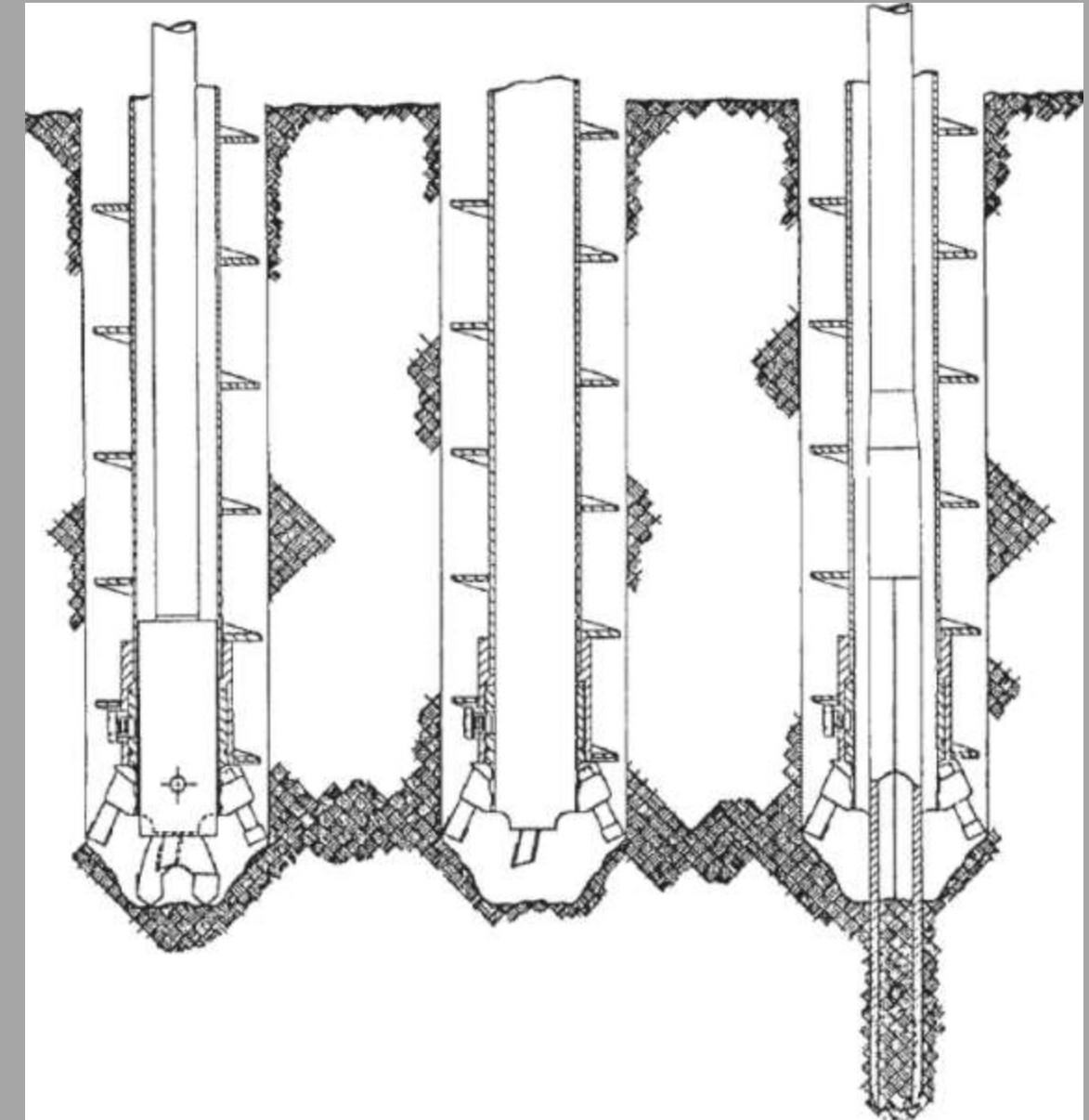
The auger spirals convey the unconsolidated formations to the surface, typically with no drilling fluids. Once the bore hole reaches the desired depth, the hollow stem acts as a temporary casing, keeping the sides of the bore hole from caving in. The driller can take samples through the hollow stem.

ADVANTAGES

- Uncontaminated sampling in unconsolidated soils
- Rapid drilling into clay-filled soils
- Easy and cost-effective

DISADVANTAGES

- Not effective with boulders, large cobble stones and in loose, sandy soils
- Depth is limited to 45 meters or less



Desired features

ROTARY HEAD

High torque,
to be calculated considering the desired
diameter and depth of the borehole



AUGER JOINT

Special joint,
to prevent damages to the head caused by
the turning force of the auger



REVERSE CIRCULATION DRILLING

DRILLING METHOD

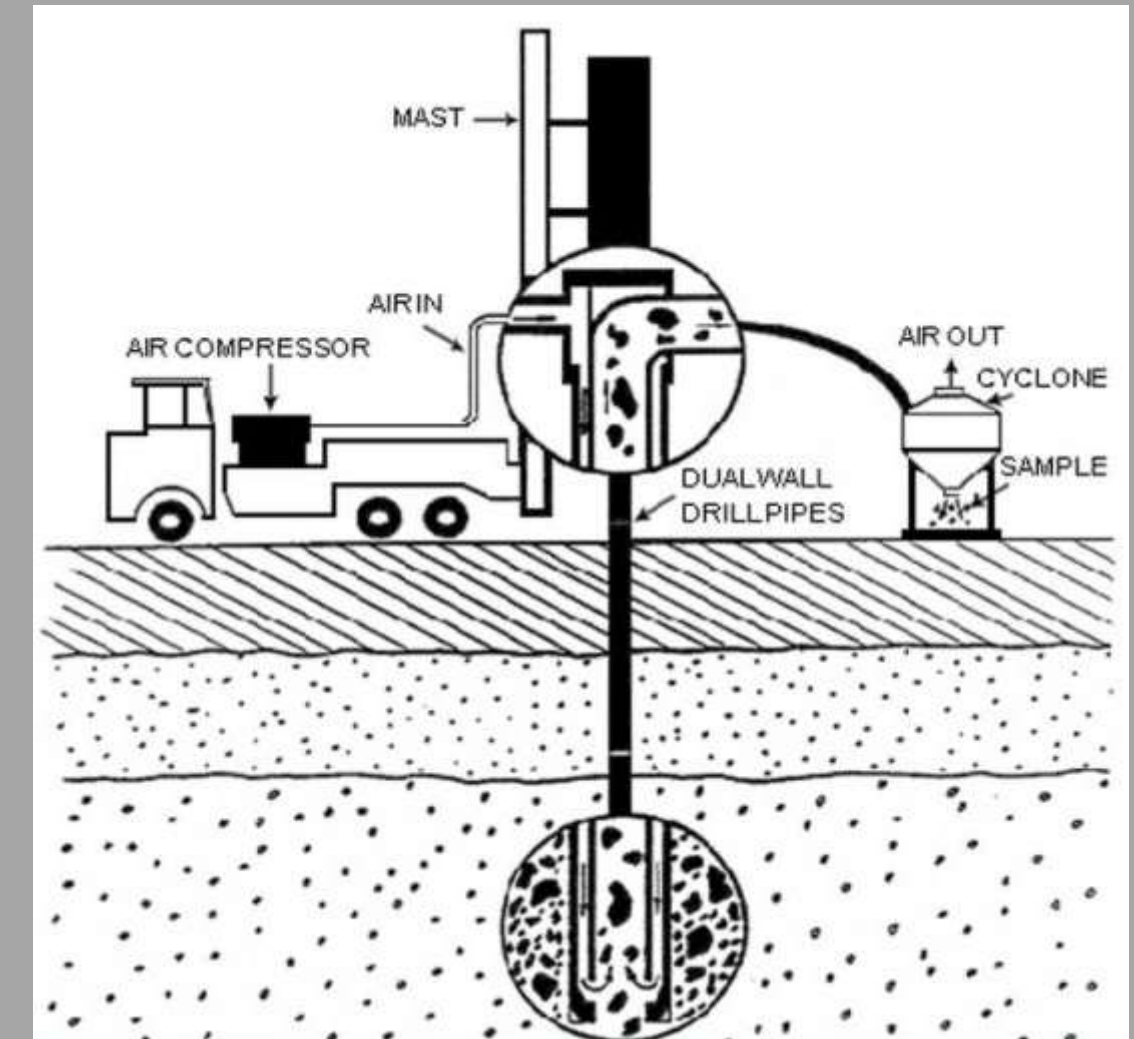
The air and cuttings are forced across the face of the bit and back up inside of the “inner tube” of special dual wall drill pipes, up to the surface. They then pass through the rotary head via a deflector elbow and along a discharge hose to the cyclone. The cyclone slows the sample, separates it from the air and collects it.

ADVANTAGES

- No cross contamination from other areas of the hole
- Unconsolidated formations without casing
- Good performances also in hard rock

DISADVANTAGES

- Inaccurate samples
- Moderate depths (up to 300 m)



Desired features

RC KIT

Swivel head positioned under the rotary head, connected to a **cuttings deviator** and a **cyclone**, for separation and sample collection



AIR COMPRESSOR

Hydraulic powered by the rig. With high flow to start the circulation system

CONVENTIONAL CORE DRILLING

DRILLING METHOD

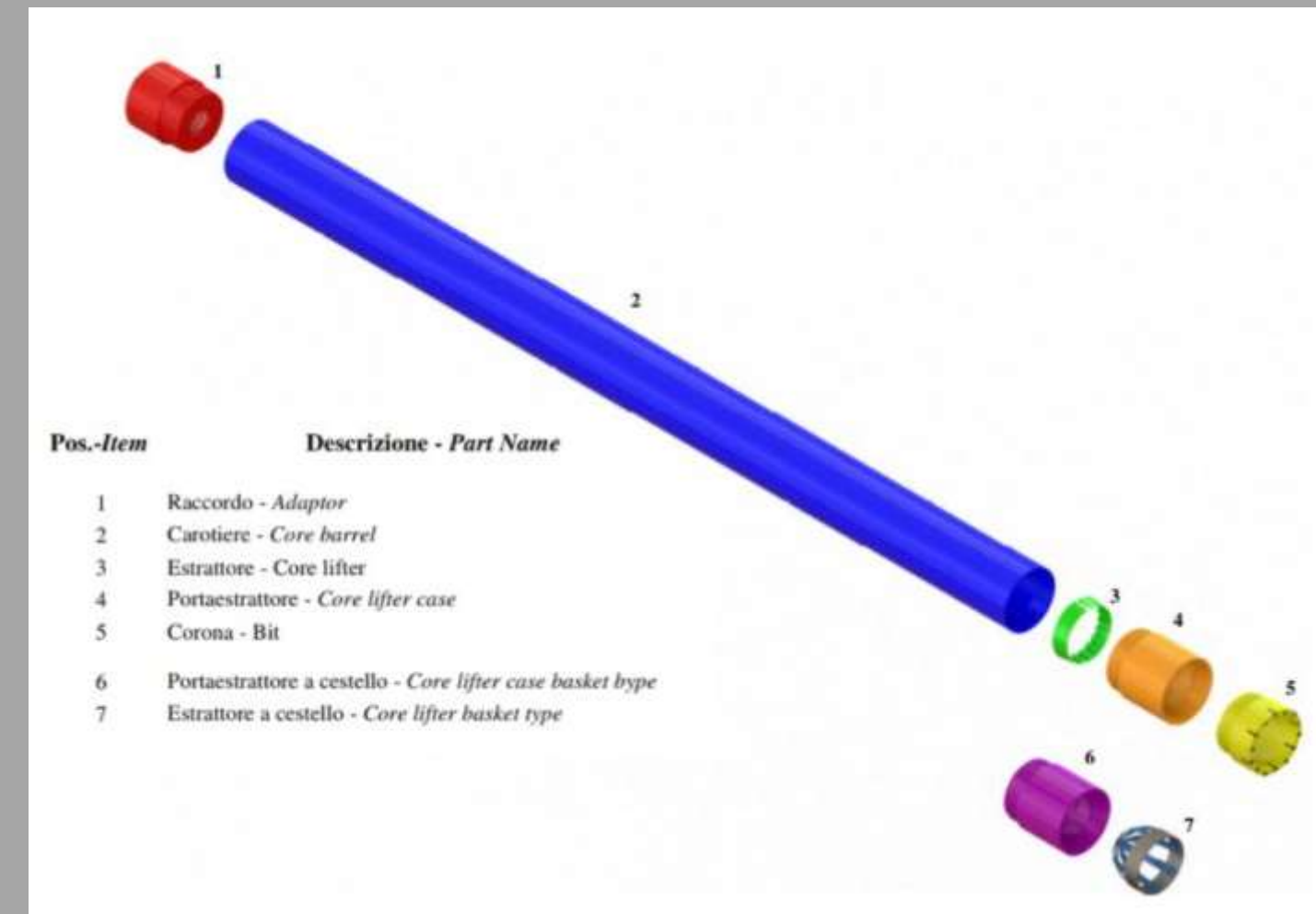
It uses a rapidly rotating drill bit, which is kept cool and lubricate by water and drilling fluids. As the drill rods advance, the cylinder of remaining rock gradually is enveloped by the pipes.

ADVANTAGES

- Very accurate samples
- Capable of drilling holes at great depths

DISADVANTAGES

- Costs are quite high
- Slow operations for recovery the carrot





WIRELINER CORE DRILLING

DRILLING METHOD

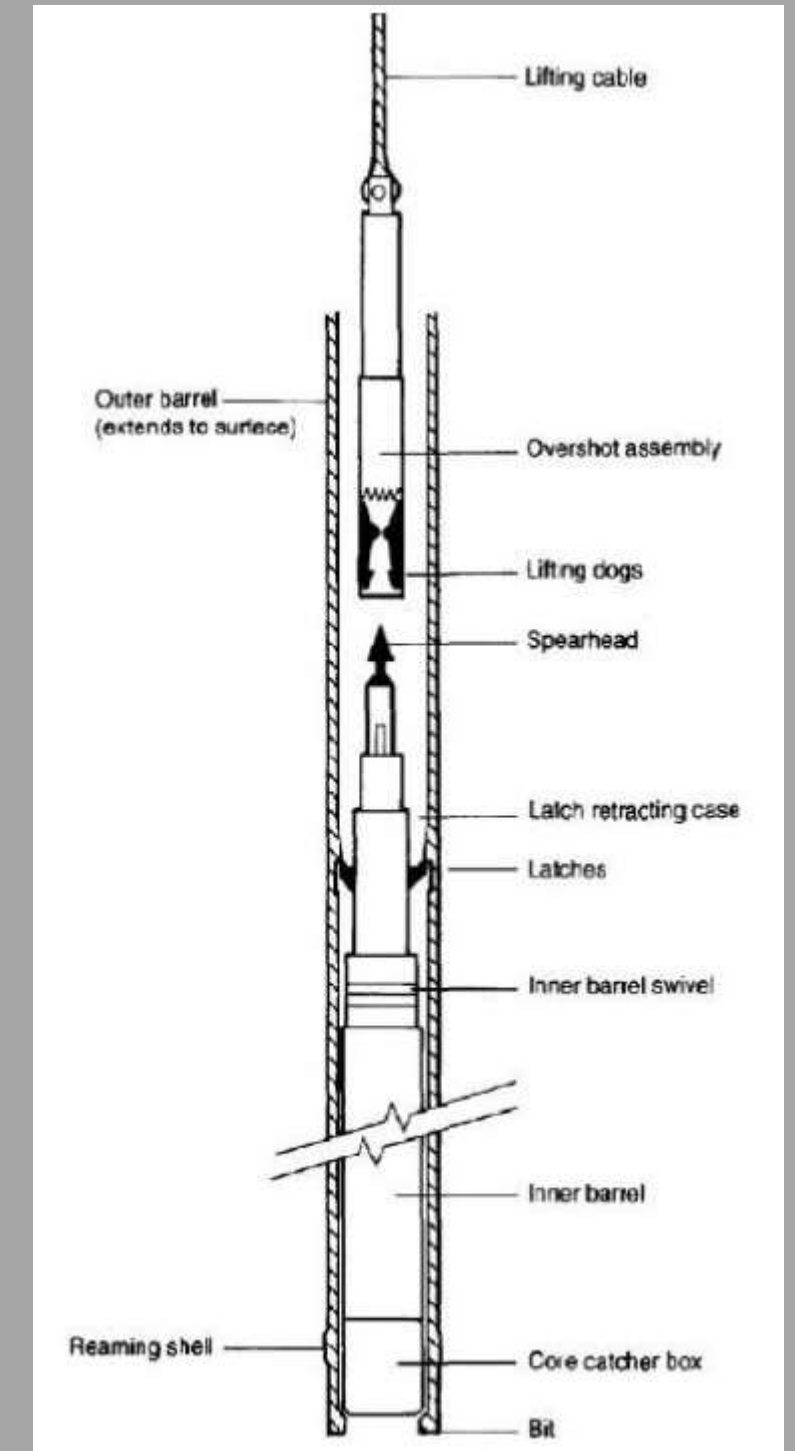
The core barrel can be removed from the bottom of the hole without removing the drill string assembly, just by using an overshot lowered at the end of the wireline and attached to the back of the core barrel inner tube. Then the wireline is pulled back and the inner tube disengages itself from the barrel.

ADVANTAGES

- Very accurate samples
- Capable of drilling holes at great depths
- Very fast operations

DISADVANTAGES

- Costs are quite high



Desired features

ROTARY HEAD

High rotation speed,
typically from 300 to 1400 rpm, rpm
depending on the diameter and rods



WIRELIN WINCH & TRIPLEX PUMP

Wireline winch with **long cable** and **fast descent** and triplex mud pump with **high pressure** to cool the bit

MASSENZA IN ESTONIA

INTRODUCING THE MI8 OF OÜ INSENERIBÜROO STEIGER

A multipurpose and highly customized drilling rig, suitable for water wells, mineral researches and geotechnical applications, able to drill:

- 45° inclined wireline coring up to 1000 m with NQ rods
- with continuous flight augers
- water wells with DTH hammer and reverse-circulation system

Main features:

- HP 107 (79 kW) diesel engine
- 12000 kg pull up and down
- Winch wireline with 1000 m of cable
- 8 speeds multi-purpose rotary head (10660 Nm - 1000 RPM)
- Triplex water pump (200 l/min - 50 bar)



Massenza Drilling Rigs - www.massenzarigs.com



100% CORE RECOVERY

With MASSENZA MI8 drilling rig and
triple barrel PQ3 wireline method.
Same drill site and rock formation.



60% CORE RECOVERY

With other brand drilling rig and
single barrel method.
Same drill site and rock formation.



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