HOW IS COAL MINED?

OPENCAST MINING

Opencast mining = mining that takes place from surface quarries (or open pits)

All of the overlying rock (**overburden**) must be removed, this will be critical to the economics of the process. The sides of an open pit are **dug at an angle and stepped** in order to increase stability and prevent collapse. The flat parts of the steps are called **benches**.

The angle of the sides depends on:

- **Rock type**: weak, incompetent rock like clay requires a shallower angle to prevent slumping.
- Weathering: heavily weathered rock will be weaker and need shallow sides to prevent rock falls and slumping.
- **Structures** such as faults and joints (lineations) weaken the rocks so may need rock bolts, shotcrete, wire netting, rock drains or other ground improvement strategies.

The **overburden** is removed and piled up at the sides of pits. These piles are known as **spoil heaps. Blasting is used to break up** the coal and large excavators called **dragline excavators** are used to extract it (each scoop can remove up to 450 tonnes of coal in one pass, using a large bucket on the end of the dragline). After the mining operation is completed, the mines are refilled with the overburden. In Britain, the thickest coal seams being mined are ~2.5m whereas, in the USA, the thickest seams are ~30m.

UNDERGROUND COAL MINING

- **Spoil heaps** comprise of waste rock piled up on the ground beside a mine.
- Longwall mining is a highly mechanised method of underground mining.
- A shaft is a vertical opening of an underground mine.

Longwall mining (the main method used in the UK) involves **digging a shaft** from the surface to the reserve and **digging tunnels or roadways** away from the shaft. A **ventilation shaft** is also vital.

In **Longwall mining**, **two horizontal roadways** are driven out to the furthest of the area of coal being extracted in order to **assess geological conditions** before extraction.

After this, a **coalface (up to 400m**) (a longwall) is established **between the two roadways** and a r**otating machine** called a **shearer** moves to and fro **along the coalface**, cutting slices of coal. **The coal falls onto a conveyor** belt and is **transported t**o the shaft and up to the surface.

The roof is held up by **mobile hydraulic steel supports called chocks**. Once a slice is removed, the chocks move **forward** and **the mined-out area is allowed to collapse**. This system of **deliberate collapse** can cause **subsidence** on the surface.

Mining will **retreat towards the shaft** so that the mine can be used in the event of a collapse – it does not obstruct the route to the shaft. However, if the mined-out area **does not collapse immediately** then **a cavern can open** up, putting **immense pressure on the chocks**.



Geological factors making coal mining difficult and uneconomic	
Faults displacing a coal seam	Throws of as little as 1cm to 2cm can disrupt the
	production as machinery must be moved. Sandstone
	(hard and competent from a delta) can be
	encountered in which case damage occurs to the
	chearer
	Foults are also zones of normeability and weakness
	co may cause flooding or collance of roadways (chafts
Folds and stoop dive	so may cause nooung or conapse of roadways/sharts.
Folds and steep dips.	Longwaii mining can only take place n orizontally so it
	is not possible if the coal seams dip at an angle
	greater than " 5 degrees.
Washouts resulting from river channel switching on	The peat is eroded away by the river and river
the delta top	channel sands and gravels are deposited in its place.
	Not only does this mean that the coal seam is lost but
	there will also be hard sandstones and conglomerates
	in its place.
Seam splitting	When one thick coal seam splits into several thinner,
	uneconomic coal seams. This occurs if there are
	differential rates of subsidence in the delta.
Sandstones	These are hard and permeable so may allow flooding
	of the mine, especially if the water table is high.
	Rapid alternations with rock types that are harder in a
	deltaic sequence can damage the shearer.
The build-up of methane gas	Methane is highly flammable and can cause
	dangerous underground explosions.

Opencast coal mining is **very efficient and high rates** if production can be achieved. This is vital as coal is a **cheap**, **bulk commodity**. It can be extracted down to depths of **100m or exceptionally 200m** provided the ratio of the stripped overburden to the coal is **less than 20 to 1**.

Longwall underground coal mining is **highly mechanised** and so can achieve similar yields as open cast mines provided the **geological conditions are favourable**.

Opencast mining is cheaper than underground mining; the **setup costs are lower** and a **smaller workforce** is required. Although the machinery can be expensive. It is much cheaper than the **high-tech machinery needed in longwall mining**. Moreover, **thinner coal-seams** can be **extracted at a profit** as they are easier to extract. Opencast mining is **also safer** than underground mining. **Ventilation equipment is not required** for an open pit.

Underground mining is a dangerous occupation. The main dangers are **cave-ins** and **tunnel collapses**, explosions caused by **methane gas and flooding. Rescue of mine workers** trapped in an underground mine is also difficult.



