COAL HANDLING

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Mining Department-III-CLASS
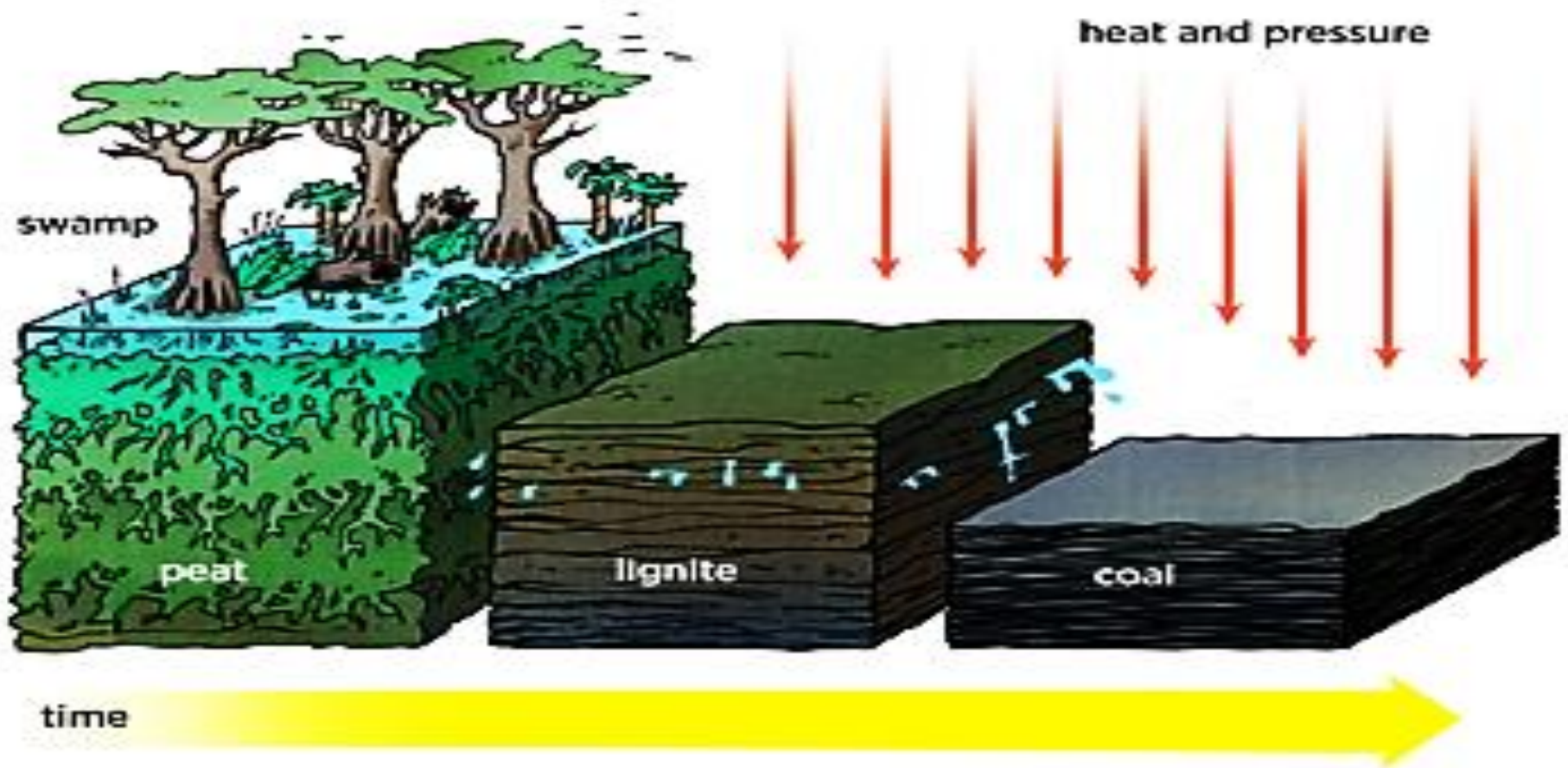
University of Mosul

LEC. NO. 5

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INTRODUCTION

- What Is Coal?
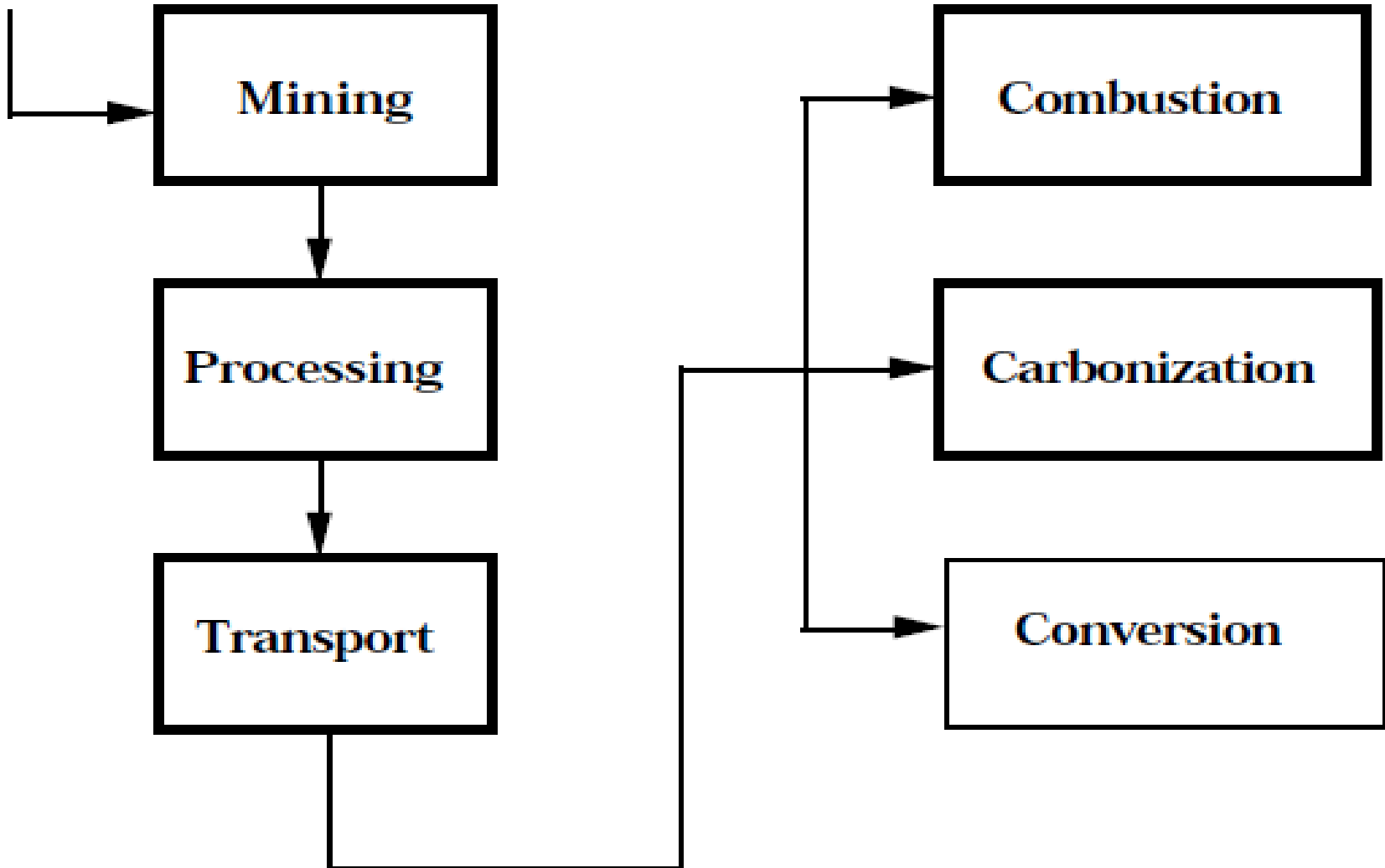- How Coal Forms?

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Properties of Coal

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	<---------- **Low Rank** ------->	<---- **High Rank** ------------>		
Rank:	Lignite	Subbituminous	Bituminous	Anthracite
Age:	--------------------------------- increases --------------------------------->			
% Carbon:	65-72	72-76	76-90	90-95
% Hydrogen:	~5 ------------------------ decreases ------------------------ ~2			
% Nitrogen:	<--------------------------------- ~1-2 --------------------------------->			
% Oxygen:	~30 ------------------------ decreases ------------------------ ~1			
% Sulfur:	~0 ------------- increases ------------ ~4 --- decreases --- ~0			
%Water:	70-30	30-10	10-5	~5
Heating value (BTU/lb):	~7000	~10,000	12,000–15,000	~15,000

Coal Utilization

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Coal

```
[Coal] → [Mining]
              ↓
         [Processing]
              ↓
         [Transport] ──────────┐
                                │
                        ┌───────┼──→ [Combustion]
                        │       │
                        ├───────┴──→ [Carbonization]
                        │
                        └──────────→ [Conversion]
```

Coal Handling System

"Mechanical handling" of coal is preferred over "manual handling" due to the following reasons:

- **Advantages**:
- 1. Higher reliability.
- 2. Less labour required.
- 3. Economical for medium and large capacity plants.
- 4. Operation is easy and smooth.
- 5. Can be easily started.
- 6. With reduced labour, management and control of the plant becomes easy and smooth.
- 7. Losses in transport are minimized.
- **Disadvantages:**
- 1. Needs continuous maintenance and repair.
- 2. Capital cost of the plant is increased.
- 3. In mechanical handling some power generated is usually consumed, resulting in less net power available for supply to consumers.

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Requirements of Good Coal Handling Pla

- **It should :**
- Need minimum maintenance.
- Be reliable.
- Be simple and sound.
- Require a minimum of operatives.
- Be able to deliver requisite quantity of coal at the destination during peak periods.
- Be minimum wear in running the equipment due to abrasive action of coal particles.

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Coal Handling Equipment According to Process Activity

- **Unloading equipment**
- Car Shakers, Rotary car dampers, unloading towers and bridges, self-unloading boats, lifts trucks, cranes and buckets

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Coal Handling Equipment According to Process Activity

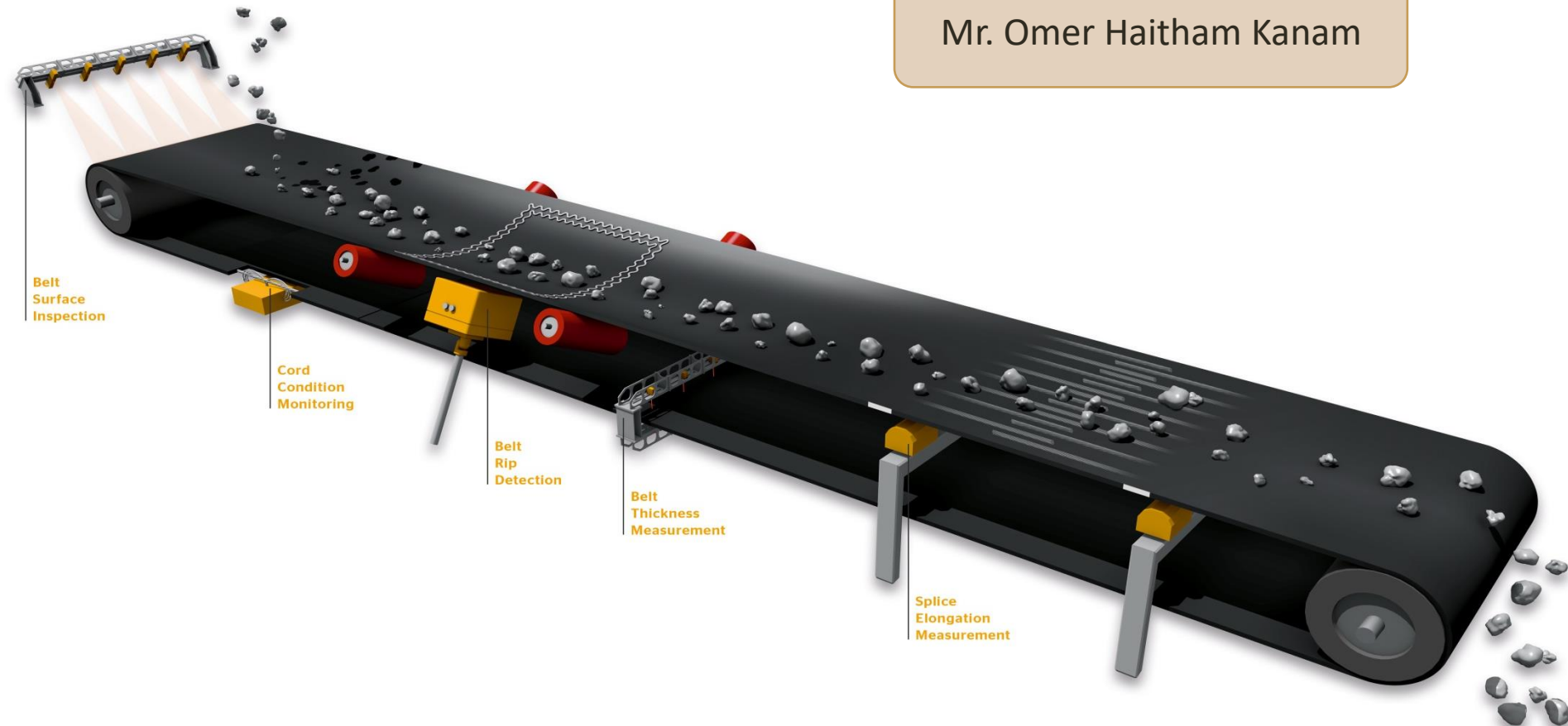- **Preparing equipment**
- Crushers, sizers, and driers

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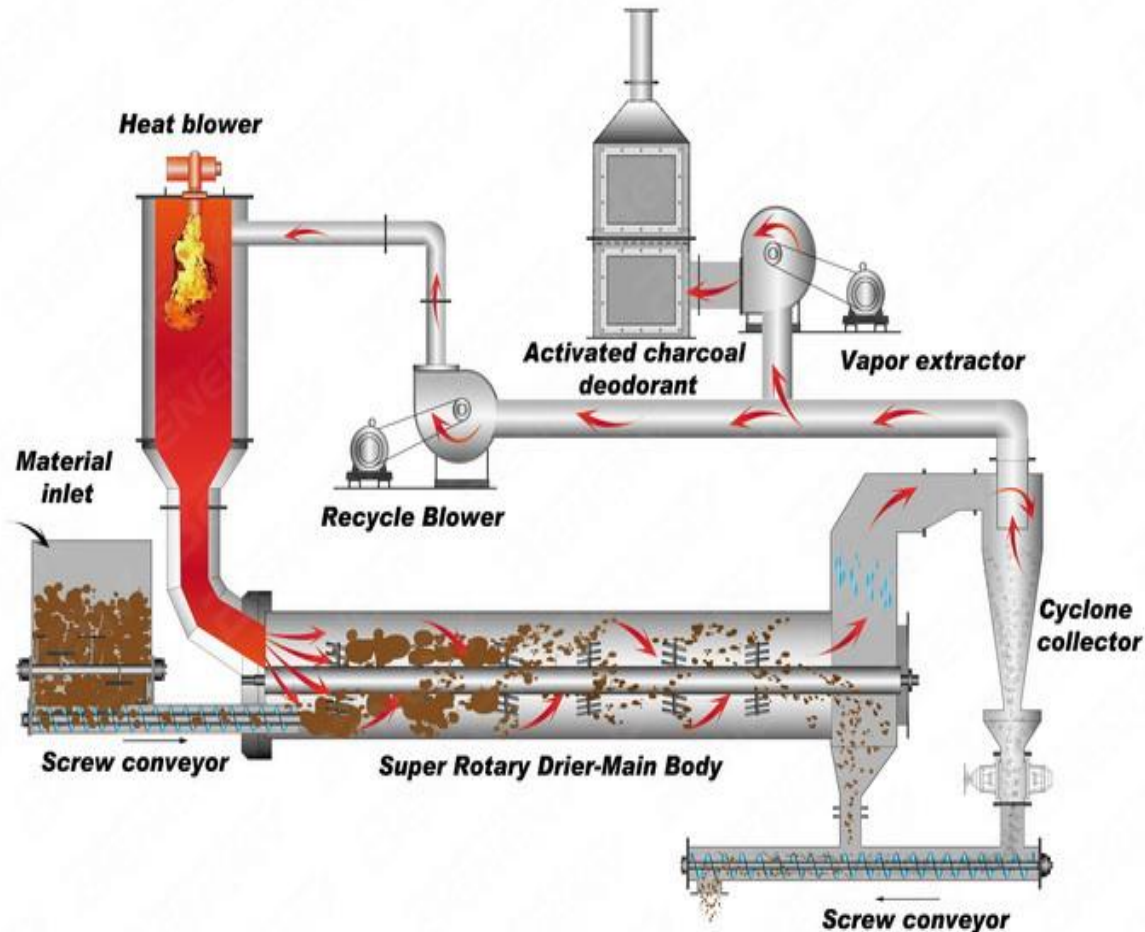
Coal Handling Equipment According to Process Activity

- **Transfer Equipment**
- Belt conveyor, screw conveyor, bucket elevator, skip hoist, flight conveyor

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Belt Surface Inspection

Cord Condition Monitoring

Belt Rip Detection

Belt Thickness Measurement

Splice Elongation Measurement

Coal Handling Equipment According to Process Activity

- **Storage Equipment**
- Bulldozer, scraper, tramways, cranes and conveyor systems

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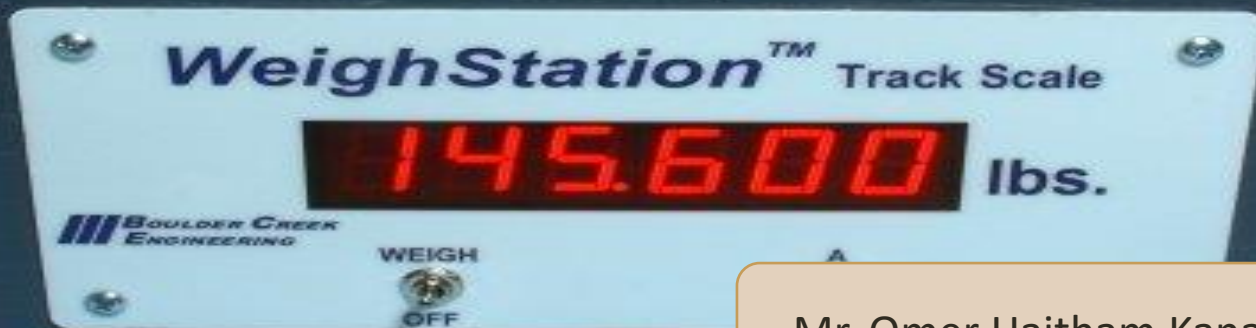# Coal Handling Equipment According to Process Activity

- **Covered storage equipment**
- Bins, bunkers, indicators, gates and values

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Coal Handling Equipment According to Process Activity

- **Weighing Devices**
- Scales, coal meters and samplers

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Coal Handling Plant

- What is CHP?
- Normally Thermal Power Station receives the coal by three modes of transportation:
- By Railway (80-90% of the requirement is fulfilled by this way)
- By Road (if required 5-10% of the requirement is fulfilled by this way)
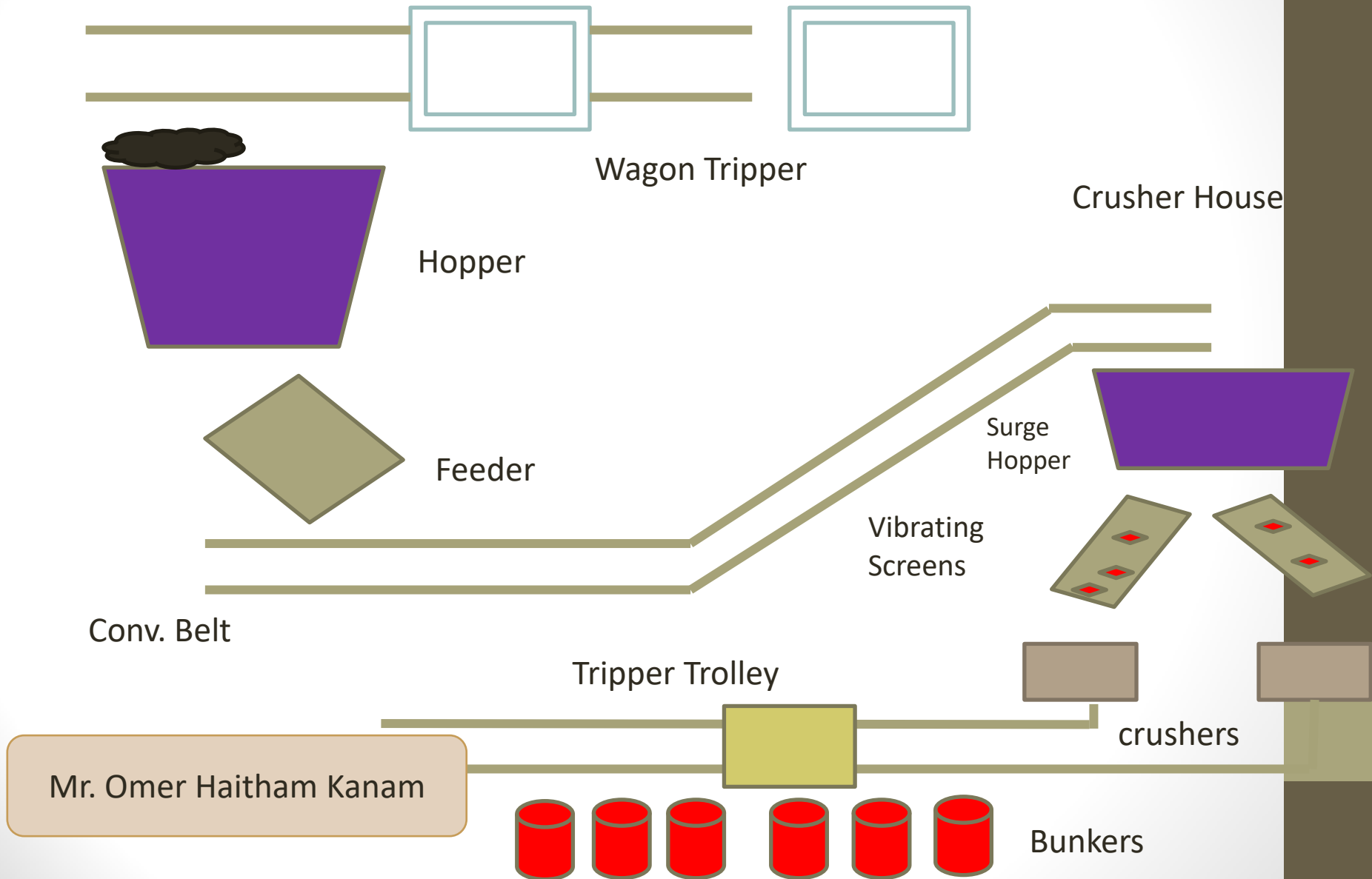- By Arial rope ways

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Coal Handling Operation Plant

- Before crusher Belt Conveyor is provided by hanging magnet
- Coal is Conveyed to Primary Crusher (100mm size)
- Vibrating screen used to feed the secondary crusher (> 25mm size)
- Coal is crushed by 25mm size
- 25mm crushed coal send to bunkering belt then to bunkers (coal bunkering)
- In case bunkers are full, coal stored in stock yard. (stacking)
- When coal is not available in plant by (rail, rope ways), stacked coal diverted to the coal bunkers by reclaiming conveyor belts.
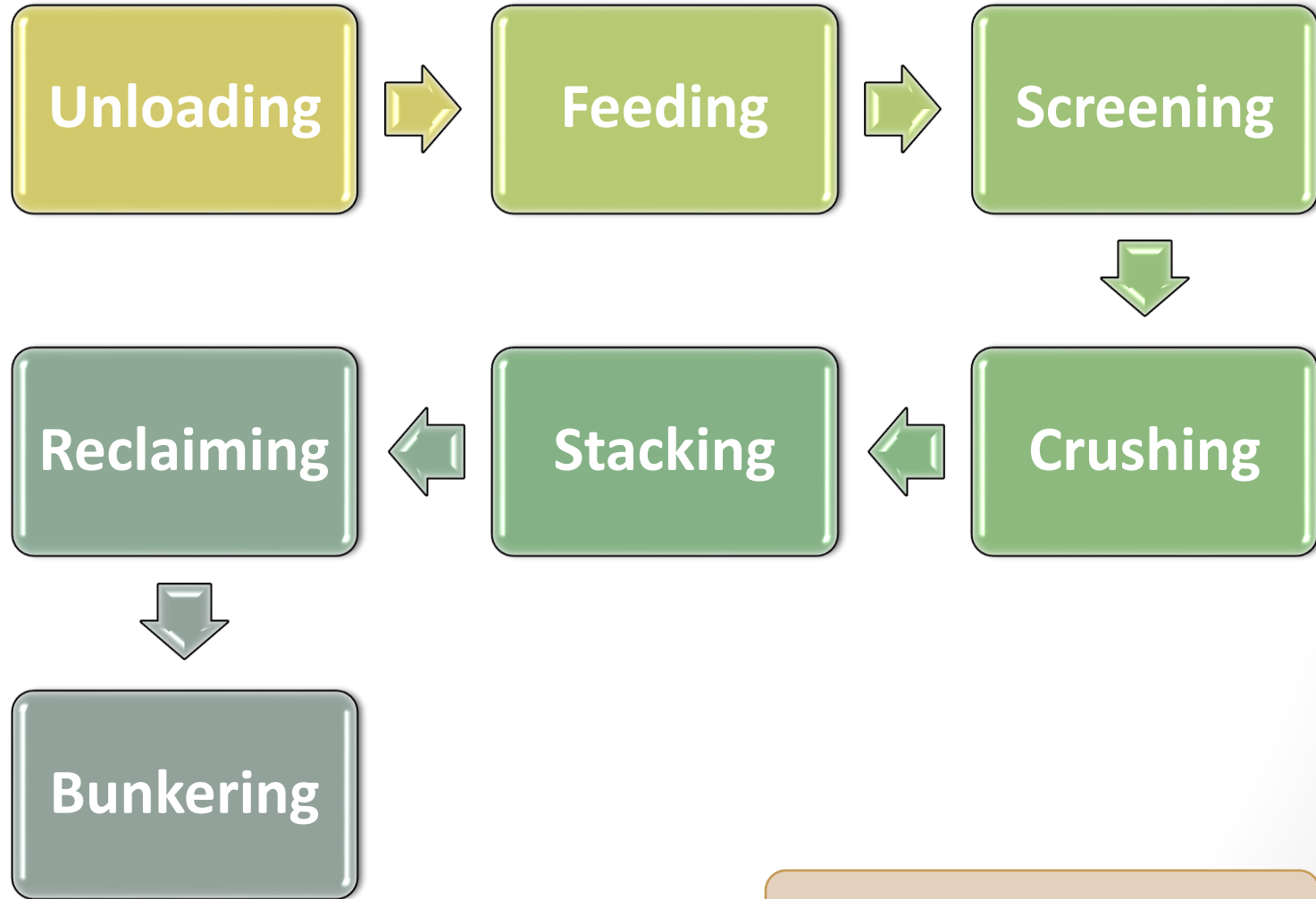- Coal stored in bunkers and send to coal mill.

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General Layout

General Layout of CHPS

Wagon Tripper

Crusher House

Hopper

Feeder

Surge Hopper

Vibrating Screens

Conv. Belt

Tripper Trolley

crushers

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Bunkers

Coal Process Activities

Unloading	→	Feeding	→	Screening

Reclaiming	←	Stacking	←	Crushing

Bunkering

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Coal Process Activities

UNLOADING

TRACK HOPPERS

HOPPER OPNNING

CONCRETE AND STEEL PLATE

CONVEYOR BELTS

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BELT SUPPOTER

Coal Process Activities

Geared Brake Motor

Sample Inlet Hopper

Hopper Gate

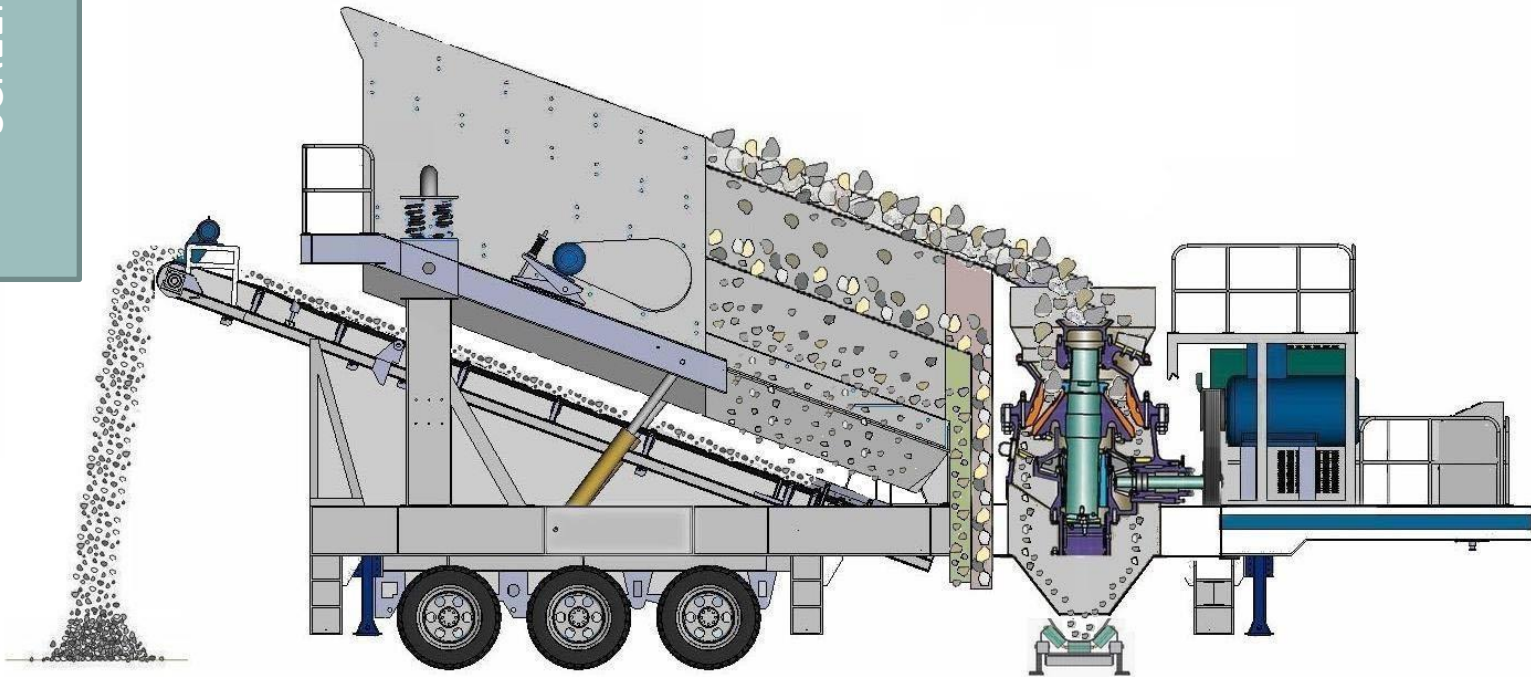Belt Shrouds

Base Frame

Under Speed Proximity Switch

Belt
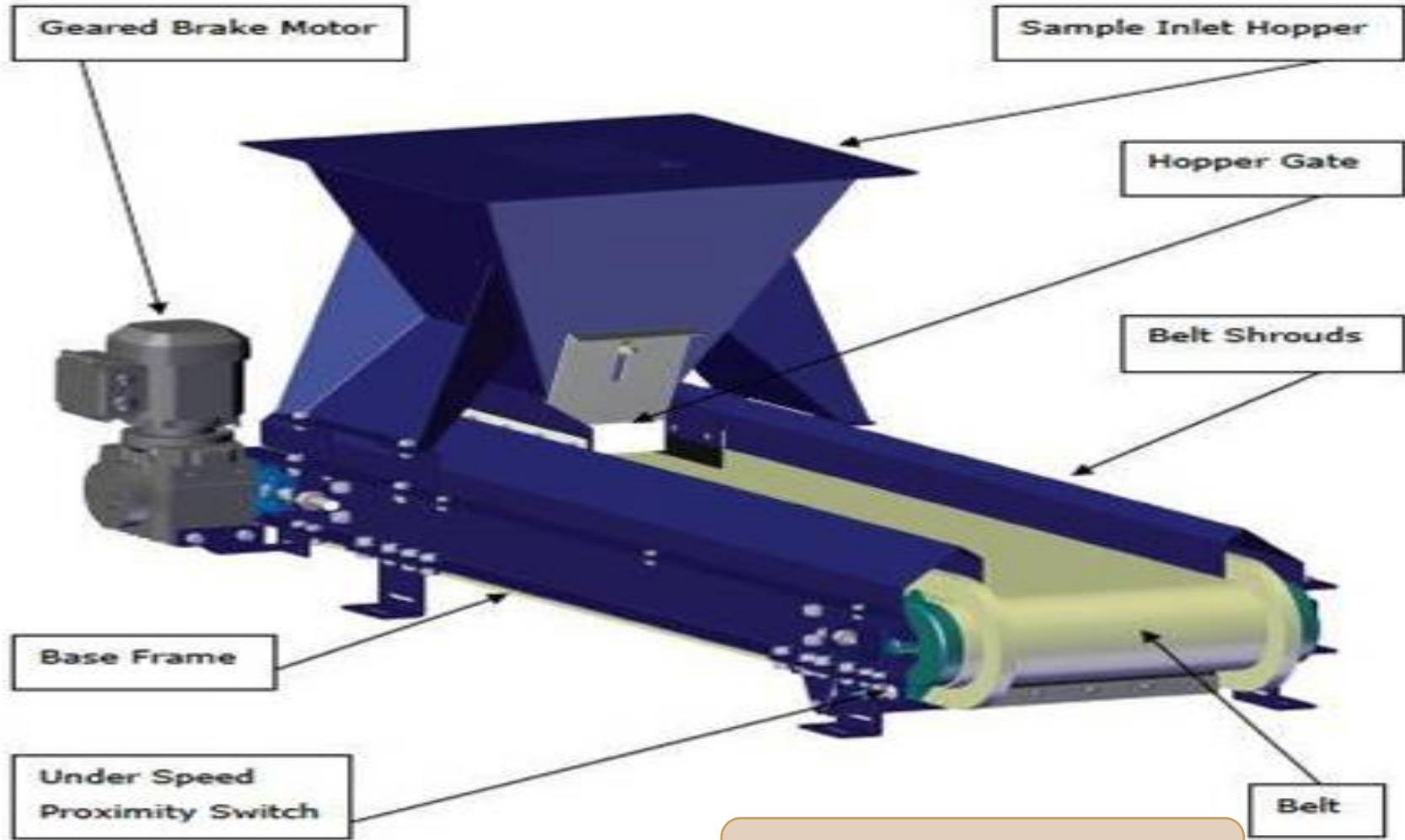
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Coal Process Activities

SCREENING

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Coal Process Activities

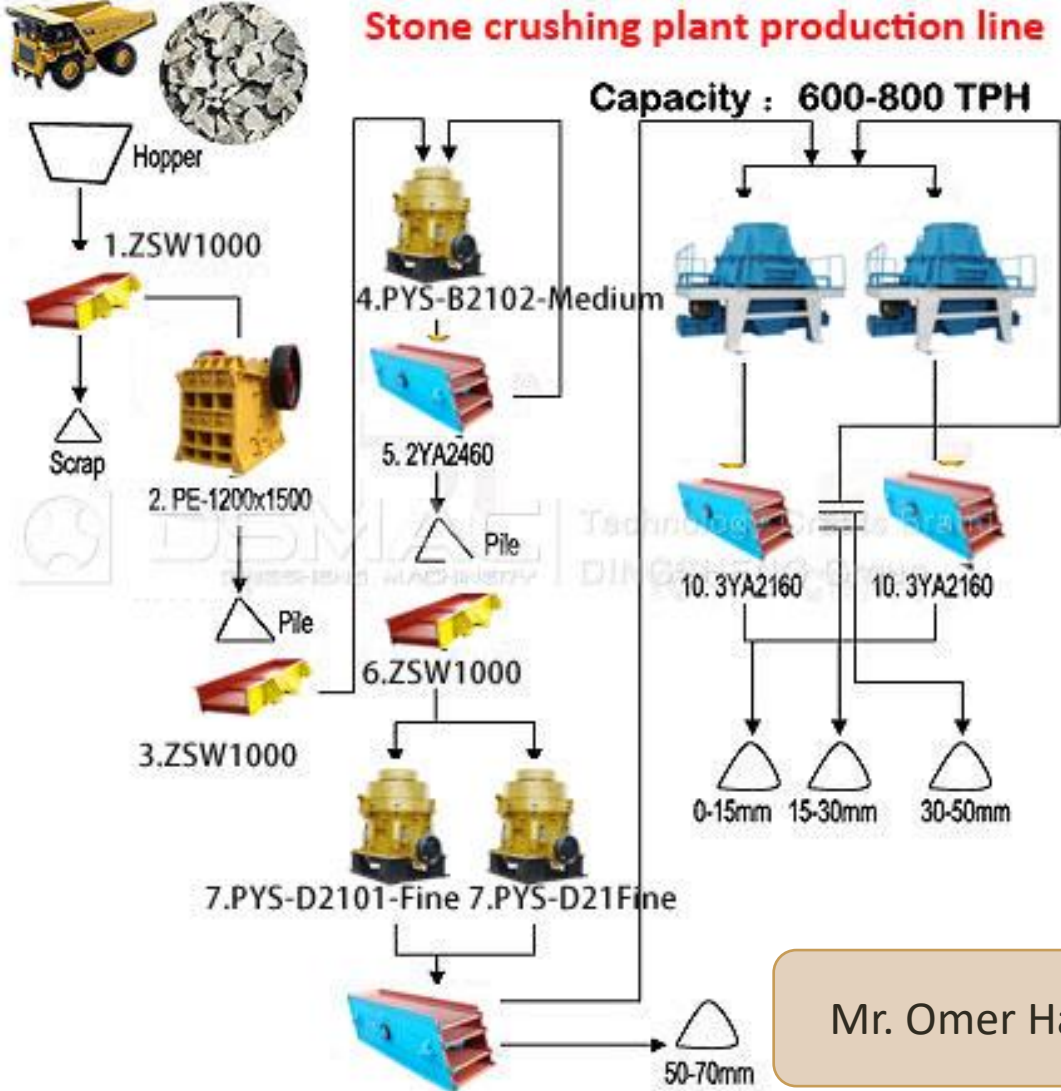**Mechanical Reduction Size Methods**

Impact   Attrition   Shear   Compression
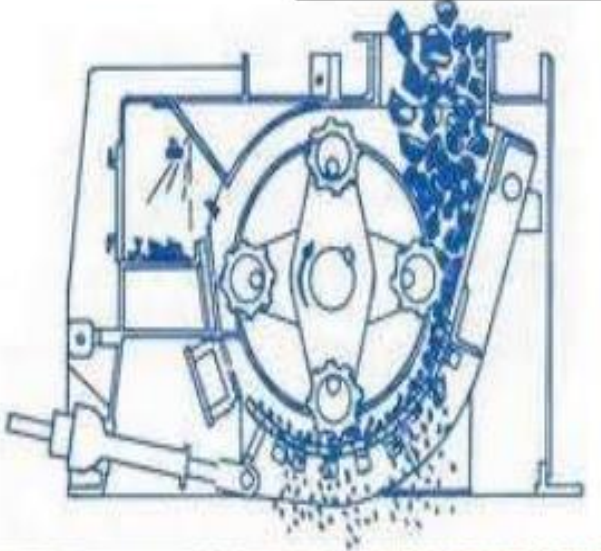
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Coal Process Activities
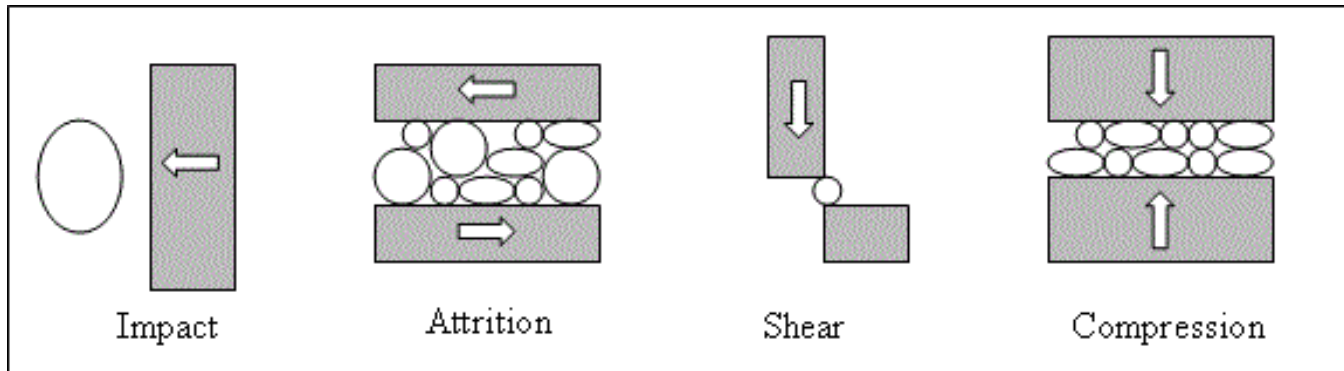
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Coal Process Activities

CRUSHING

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Coal Process Activities

STACKING

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Coal Process Activities

BUNKERING

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METHODS OF COAL TRANSPORTING

- **1. SEA**
- **2. ROAD**
- **3. ROPWAYS**
- **4. RAIL**
- **5. PIPELINE**
- **Advantages of Pipeline Method**
- Simplicity in installation and increased safety in operation.
- More economical when dealing with large volume of coal over long distances.
- It's not affected by climate and weather.
- High degree of reliability.
- No loss of Coal
- Manpower requirement is low.

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Precautionary Measures before Transporting

- Weighing of Coal

- **Coal Weight=Weight** of Tripper with coal **-Weight** of Tripper without coal

- Payment of Coal

- Stone shells (Manually or Special Devices)

- Chemical Analysis of Coal (Calculations of Calorific value)

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General Problems faced in Coal Handling Plant

- ## Design Problems
  - Less cal. Value
  - More ash
  - Low Bunkering
- ## Rainy Season Problems
  - Problems with Electromagnetic feeder problems at input point because coal is muddy and wet
- ## Other Misc. Problems
  - Snapping of belts /ropes (damaged and more maintenance time)
  - Derailment of coal wagons
  - Oversized coal/Muddy Coal

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Coal Storage / Types

- 1. Dead Storage
- Supplies the coal where there is a shortage of coal in plant due to failure of normal supply of coal.
- Requires Protection of weather
- 2. Live Storage
- Supplies coal to plant for day to day usage.
- Capacity of live storage is less than that of dead storage.
- Usually stored in vertical cylindrical bunkers

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Characteristics of Coal Storage

- Coal Heaps Storage
- Keep coal at low temperature (max. 70ºC)
- Prevention of air circulation from bottom of coal piles
- Proper drainage of rainy water to prevent weathering – drainage should not be rapid to prevent washing away of coal.
- Underwater Storage
- Slow oxidation can be eliminated
- Spontaneous combustion can be eliminated

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Site Selection for coal dead storage

- 1. Free from standing water.

- 2. Artificial drainage should be provided.

- 3. Free from all foreign materials like wood, paper rags, waste oil or material having low ignition temperature.

- 4. Handling cost should be minimum.

- 5. Pile should build up in successive layer and compact.

- 6. Pile should dress to prevent entry of rainy water.

- 7. Alternative drying and wetting should avoid.

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Site Selection for coal dead storage

- 8. Stoker size coal should be oil treated to prevent absorption of water, O2, and compaction which is not needed.

- 9. Side of pile should not be steep.

- 10. Air may circulate freely through pile for proper ventilation to keep temperatures low.

- 11. Hot surfaces or boiler blow down or hot water or steam pipes and tanks should far from coal storage.

- 12. Hot bright days are to be avoided.

- 13. There should be provision for temperature measurement at different points.

- 14. Conical piling should be avoided.

- 15. Firefighting equipment should be easily available.

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Questions?

Thank you

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