

## safe operation of coal grinding systems raw coal yard management

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*Preventive explosion protection* makes it difficult for fires and explosions to happen. For this, the safe operation of the system is necessary. For the handling of the raw coal this means:

- No coal undergoing intensified oxidation reaches the conveyor belt to the raw coal silos.
- No tramp metal, **Fe & Non-Fe**, reaches the raw coal silos.

Depending on the properties of the coal and the condition in which the coal arrives on the raw coal yard as well as on weather and stockpile conditions, the coal's natural continuous oxidation as result of its exposure to the O<sub>2</sub> of the ambient air may intensify.

Especially coal with a high volatile content is prone to intensifying oxidation in the stockpiling.

This intensification must not happen, but it can happen.

Such intensified oxidation **has to be discovered early** and then **be dealt with effectively and fast**.

The intensified oxidation **can normally be smelled early**, meaning that the stockpiles have to be monitored by personnel. The frequency of inspection rounds has to correspond with the likeliness of occurrences. Know your coal.

Professional technological possibilities of detection are man-carried IR cameras. Such cameras for permanent installation also exist.

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And CO can also be detected by man-carried or permanently installed sensor technology.

Released CO (roughly the same weight as air) would be dangerous for people moving between the stockpiles and is explosive\* in certain concentrations as well.

CO-in-air may remain concentrated close to the floor level. Access to areas with a high CO concentration has to be inhibited. CO is invisible and doesn't smell.

During intensified oxidation CH<sub>4</sub> (lighter than air) may be released and accumulate under the cover of a covered storage facility. This could create an explosive gas pocket under the roof\*\*, against which forced ventilation would help.

**Safe operation of the coal grinding system means ensuring that coal undergoing intensified oxidation never reaches the conveyor belt to the raw coal silos.**

**The personnel operating the raw coal yard have to be made responsible exactly for this. This responsibility has to be charged upon them by writing it into their job description.**

What to do when intensified oxidation is discovered?  
Which means have to be available at all times?

Pockets of coal undergoing intensified oxidation have to be generously removed and drowned in water. Water sprayed on the surface of a pile does not help and runs immediately to the ground, due to the coal's hydrophobia. Extinguishing the oxidation with water running over the stockpile is not possible. The intensified oxidation will come back all the time.

There are 2 possibilities to handle water drowning:

- 1) Have a pit in the ground (several m<sup>3</sup>) in which water stands always or into which water can be released fast from a secure high capacity source, without the water being quickly absorbed by the earth that forms the walls and floor of the pit.
- 2) Have a tippable open top container with sufficient water in it and a truck with container pick-up and tipping facility available at all times.

In both cases, the suspicious raw coal or the raw coal that has been noticed as undergoing intensified oxidation needs to be generously separated from the stockpile with a wheel loader and be brought to the a.m. pit or container with the water in it and drowned completely.

The wheel loader movements have to be efficient and fast.

\* lower explosivity limit 11.3 vol. %, 94 g/m<sup>3</sup>  
upper explosivity limit 75.6 vol. %, 629 g/m<sup>3</sup>  
ignition temperature 605 °C  
values determined at 20 °C, rel. air humidity < 10 %

\*\* lower explosivity limit 4.4 vol. %, 29 g/m<sup>3</sup>  
upper explosivity limit 17 vol. %, 113 g/m<sup>3</sup>  
ignition temperature 595 °C

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For this purpose the stockpiles have to be organised in a way that there will always be **access** to problem pockets in the storage **everywhere**, so that such portions can be removed quickly.

The reading and interpretation of CO measuring may have to be learned. With experience, meaningful alarm triggering values of the CO detection can be defined.

The same applies to temperature monitoring of the stockpiles.

For high VM coal the stockpile height should not exceed 3 m. It can, but must not make sense to compact the stockpile by running a wheel loader over it. This has to be experienced.

Compacting can reduce the ingress of ambient air (O<sub>2</sub>) towards the ongoing intensified oxidation. But it will also lead to reduced heat convection, which would elevate the temperature around the smouldering spot and support smouldering.

Fe and Non-Fe detection & separation in form of belt conveyor drop-off have to be in place and working order.

The installation of an impact crusher in the conveyor line needs Fe and Non-Fe metal detection and separation upstream of the impact crusher and Fe detection and separation downstream of the impact crusher.

Bag filters for the de-dusting of the crusher's air throughput and the de-dusting of raw coal belt transition points need to have full constructional dust explosion protection: Explosion pressure shock resistance corresponding with the installed explosion venting, explosion de-coupling on their suction side and explosion isolation under their funnel hopper discharge point.

With the risk of fire in such bag filters being greater than the risk of dust explosions it is necessary to equip them with a remotely signalling fire detector.