



**LABORATORIO OFICIAL J.M. MADARIAGA (LOM)**
  
**UNIVERSIDAD POLITÉCNICA DE MADRID (UPM)**



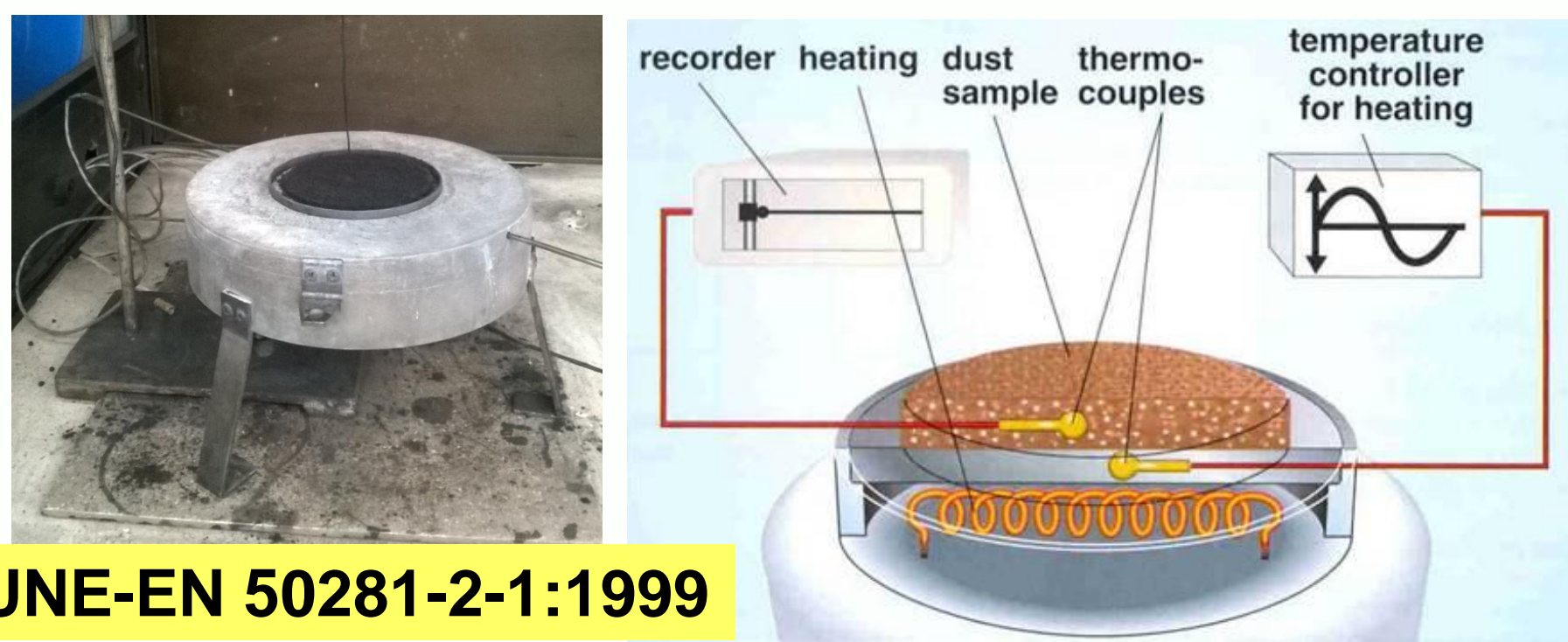
POLITÉCNICA

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# INFLUENCE OF GRAIN SIZE AND COMPACTION OF DIFFERENT SOLID FUELS ON THE LAYER IGNITION TEMPERATURE

## 1. INTRODUCTION – PREVIOUS WORK

Minimum Ignition Temperature of a dust layer - MIT-I

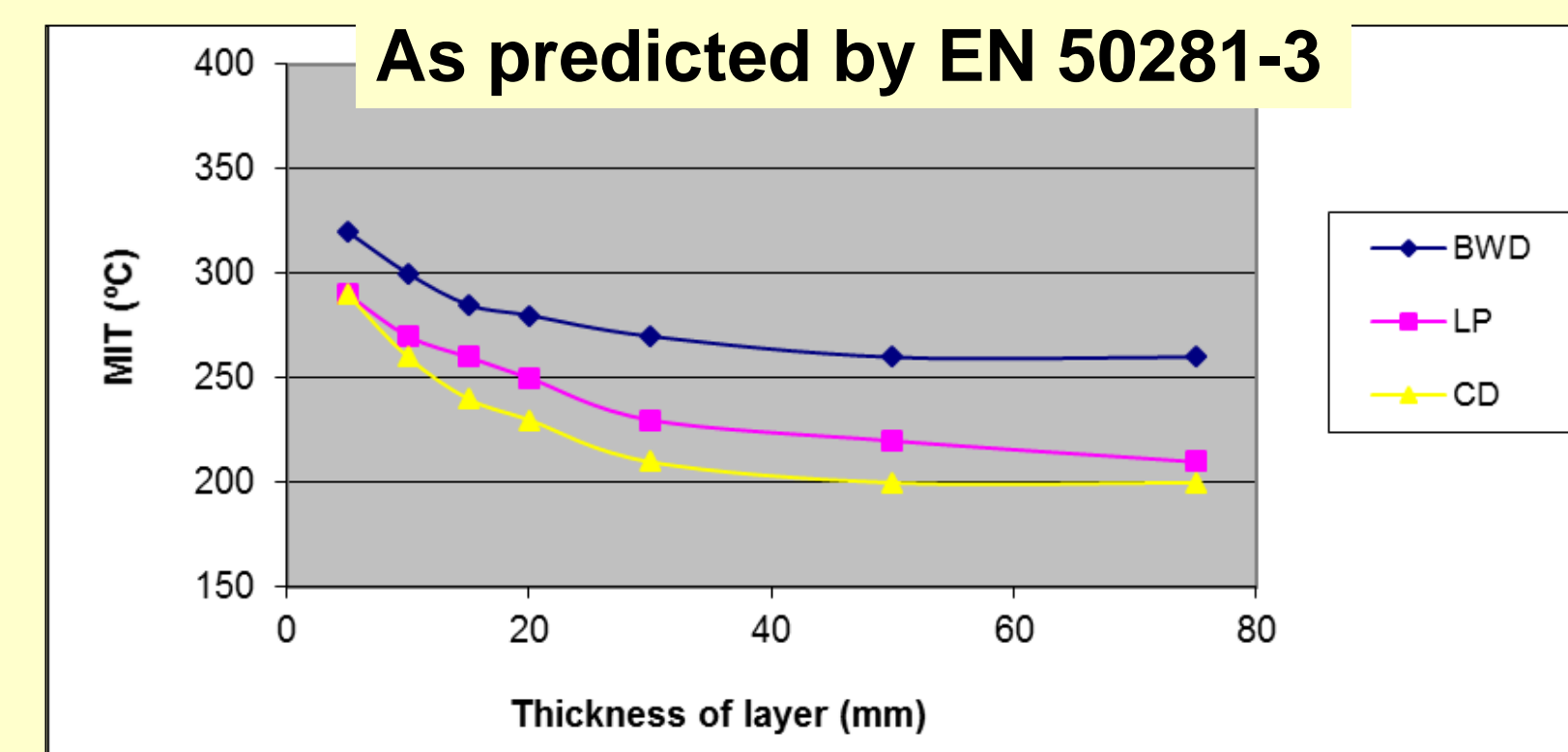


| Sample          | MIT-I (°C) |
|-----------------|------------|
| Beech wood dust | 320        |
| Lycopodium      | 290        |
| Coal dust       | 290        |

↑ Minimum Ignition Temperature for 5 mm thickness layers



Influence of thickness up to 75 mm



## 2. MATERIALS AND METHODS

Coke and bituminous coal: 5 mm to 75 mm

No compaction  
One particle size: coke = 35,6 μm  
coal = 33,4 μm



Bituminous Coal

Wood chips and wood pellets: 5 mm and 50 mm

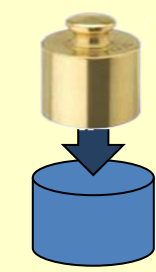
No compaction  
Two grain sizes: fine (< 180 μ) and coarse (3,2 mm)



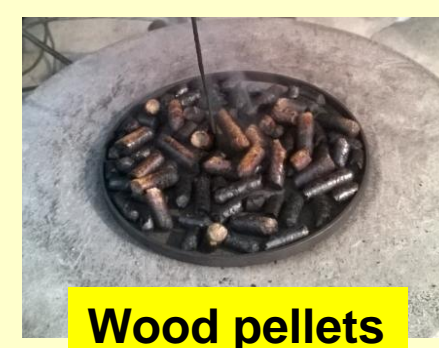
Wood chips

Dried sewage sludge and wood pellets: 5 mm and 50 mm

Compacted and non-compacted  
Two grain sizes: fine and coarse

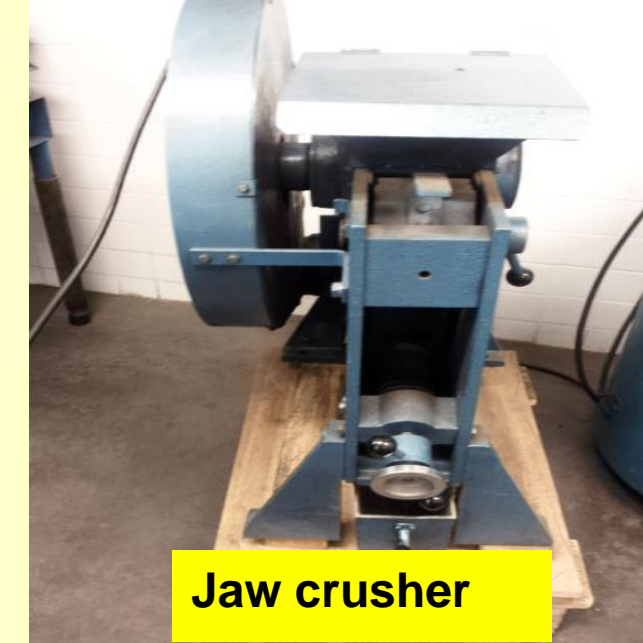


Dried sludge (pellets)

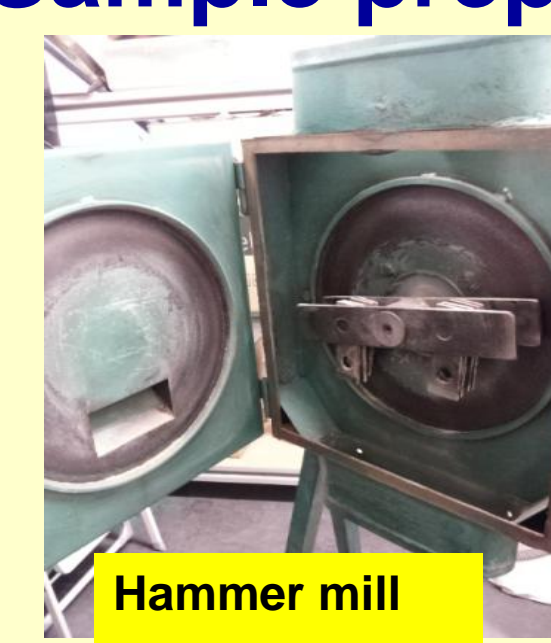


Wood pellets

Sample preparation



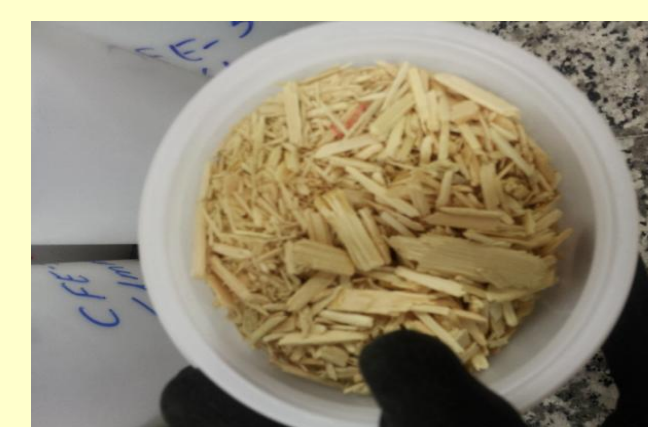
Jaw crusher



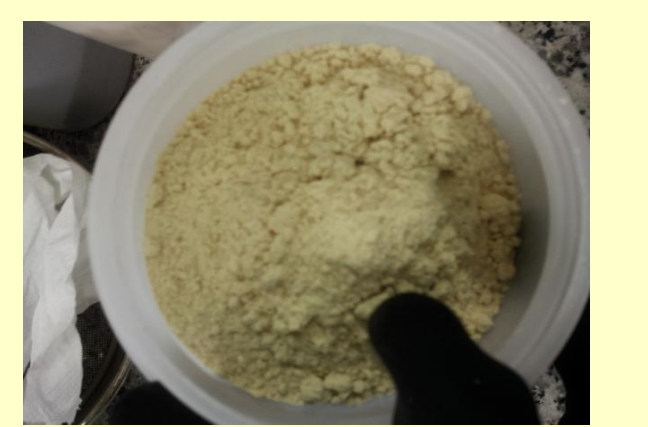
Hammer mill



Blade mill



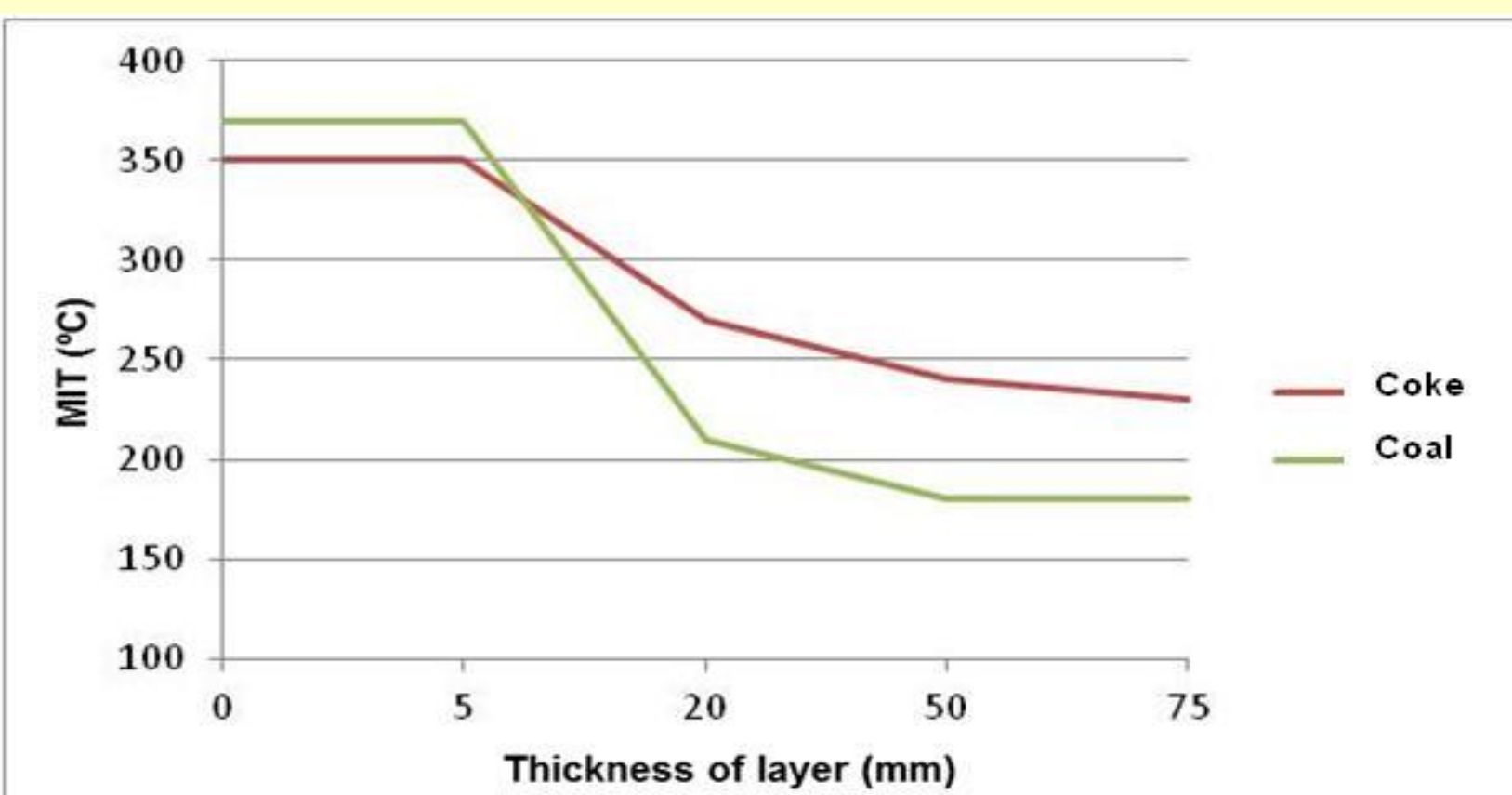
Sifter



## 3. RESULTS

Coke and bituminous coal

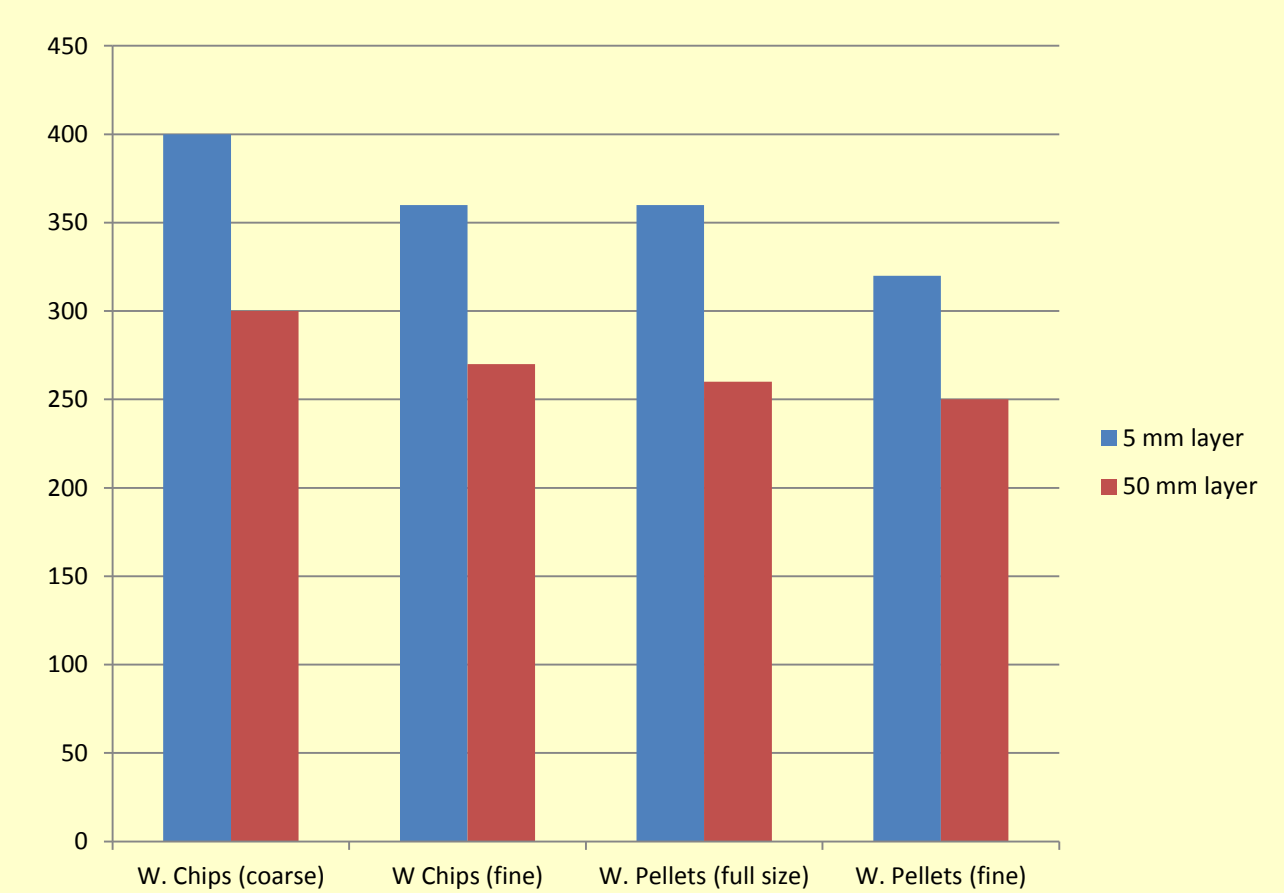
| Sample | MIT-I – 5 mm (°C) | MIT-I – 20 mm (°C) | MIT-I – 50 mm (°C) | MIT-I – 75 mm (°C) |
|--------|-------------------|--------------------|--------------------|--------------------|
| Coke   | 350               | 270                | 240                | 230                |
| Coal   | 370               | 210                | 180                | 180*               |



Wood chips and wood pellets

| Sample                        | MIT-I – 5 mm (°C) | MIT-I – 50 mm (°C) |
|-------------------------------|-------------------|--------------------|
| Wood chips (coarse: 3,2 mm)   | > 400             | 300                |
| Wood chips (fine: < 0,180 mm) | 360               | 270                |

| Sample                          | MIT-I – 5 mm (°C) | MIT-I – 50 mm (°C) |
|---------------------------------|-------------------|--------------------|
| Wood pellets (coarse: 3,2 mm)   | 360               | 260                |
| Wood pellets (fine: < 0,180 mm) | 320               | 250                |



Dried sewage sludge and wood pellets

| Sample                       | Non compacted |            | Compacted  |
|------------------------------|---------------|------------|------------|
|                              | MIT-I (°C)    | MIT-I (°C) | MIT-I (°C) |
| Dried sewage sludge (coarse) | > 400         | > 400      | > 400      |
|                              | 5 mm          | 50 mm      | 50 mm      |
| Dried sewage sludge (fine)   | 280           | 220        | 240        |

| Sample                | Non compacted |            | Compacted  |
|-----------------------|---------------|------------|------------|
|                       | MIT-I (°C)    | MIT-I (°C) | MIT-I (°C) |
| Wood pellets (coarse) | 360           | 260        | 260        |
|                       | 5 mm          | 50 mm      | 50 mm      |
| Wood pellets (fine)   | 320           | 250        | 240        |

| Sample       | Non compacted |            | Compacted  |
|--------------|---------------|------------|------------|
|              | MIT-I (°C)    | MIT-I (°C) | MIT-I (°C) |
| Sludge NFA-5 | > 400         | 250        | 240        |
| Sludge NFA-8 | 310           | 240        | 230        |
| Sludge NFA-9 | 280           | 210        | 220        |

## 4. CONCLUSIONS

- MIT-layer decreases with increasing layer thickness, for finer dust and for compacted samples
- Compaction of products delays self-ignition in fuel stockpiles at ambient temperatures, but can cause a decrease in the layer ignition temperature (EN 50281-2-1)
- Ignition of a dust layer by contact with a hot surface follows a different reaction mechanism than self-ignition. The key factor is not the oxygen access, but the spread of the reaction