Coomtech Kinetic Air Drying

Technology Introduction

For

Cementitious Additive & SCM Products

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Coomtech Kinetic Drying:

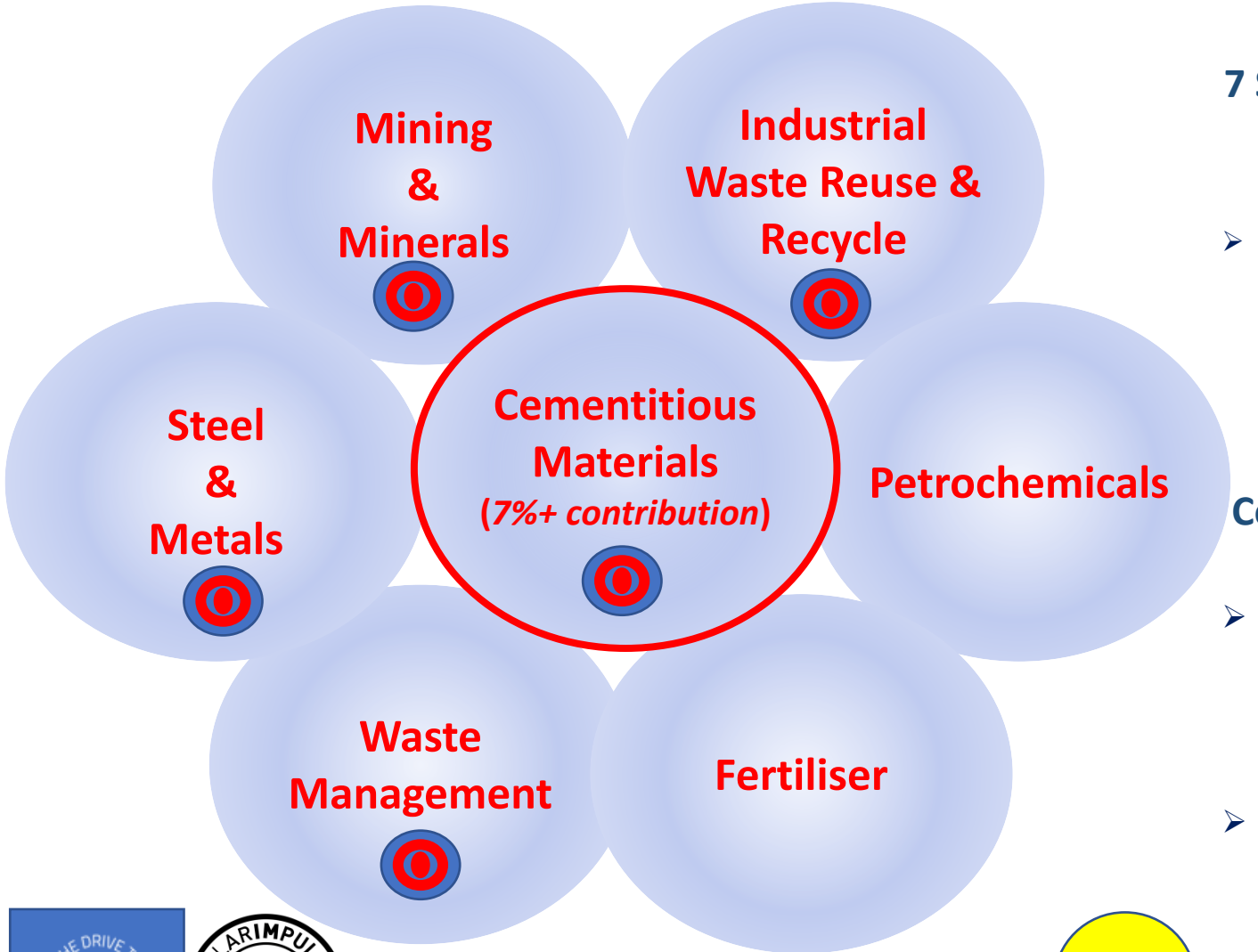
Market Sectors & Products Processed

Market Sectors

- Cementitious Products
- Minerals Processing
- Mineral Waste Streams
- Fuels Upgrading
- Industrial Waste Streams
- Pharmaceutical
- Green Fuels

Products

Coomtech Serves “Hard To Abate Sectors”



7 Sectors contribute circa 22% of global emissions – several supporting cement industries

- Renowned US Nature Magazine says:
  “cement substitution with secondary materials can reduce global annual C02 emissions by 1.3 gigatons”

Coomtech Target Areas Currently

- Coomtech Objective
  - Reduce Energy – up to 75%
  - Reduce Emission – up to 75%
- Cementitious industries are currently experimenting with materials from all these target areas

Drying Remains a Significant Cost

- Why does Coomtech reduce traditional thermal drying costs?
  - Traditional thermal drying relies upon the laws of thermodynamics , they must pass through

- the latent heat of vaporisation

- Water must be taken from ambient, through 100^0C and on up to vaporisation temperature
- All thermal technologies rely on this but each has features offering efficiencies in how the heat is applied

Coomtech Kinetic Driers DO NOT follow the laws of thermodynamics

- Coomtech Kinetic drying relies upon the shearing movement of managed turbulent air
  - Every kilowatt hour saved = saved $ / £ / Euro
  - Every kilowatt hour saved = reduced emissions – 1kW Gas = 0.20 kg CO2 Saved
    - 1kWh Oil = 0.245 kg CO2 Saved
    - 1kW Elec = 0.44906 kg CO2 Saved*
- Wherever possible allow the ambient conditions to do as much drying out as possible

Coomtech Kinetic Drying

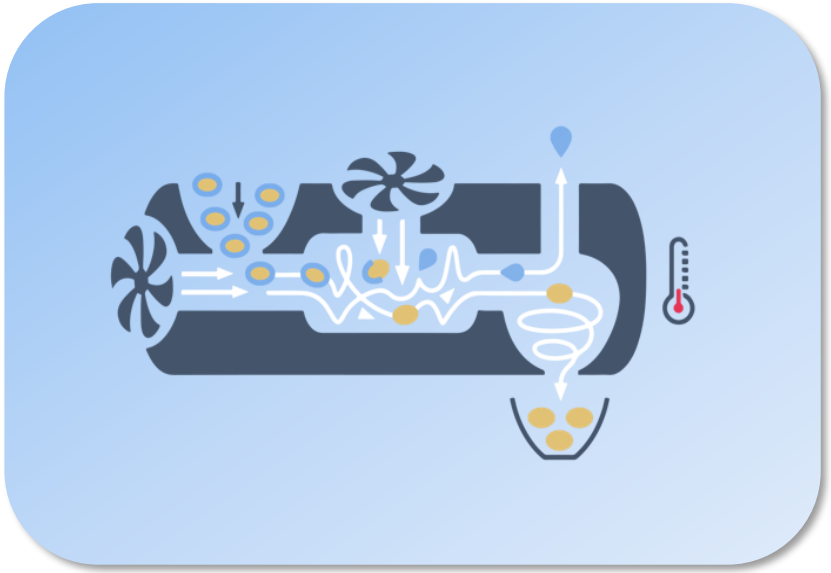
The alternative to traditional thermal driers

Coomtech SMR Kinetic Air Drying Technology was audited and approved in June 20 2021 by the Solar Impulse Foundation, in its first 1000 technologies to fight global Climate Change.

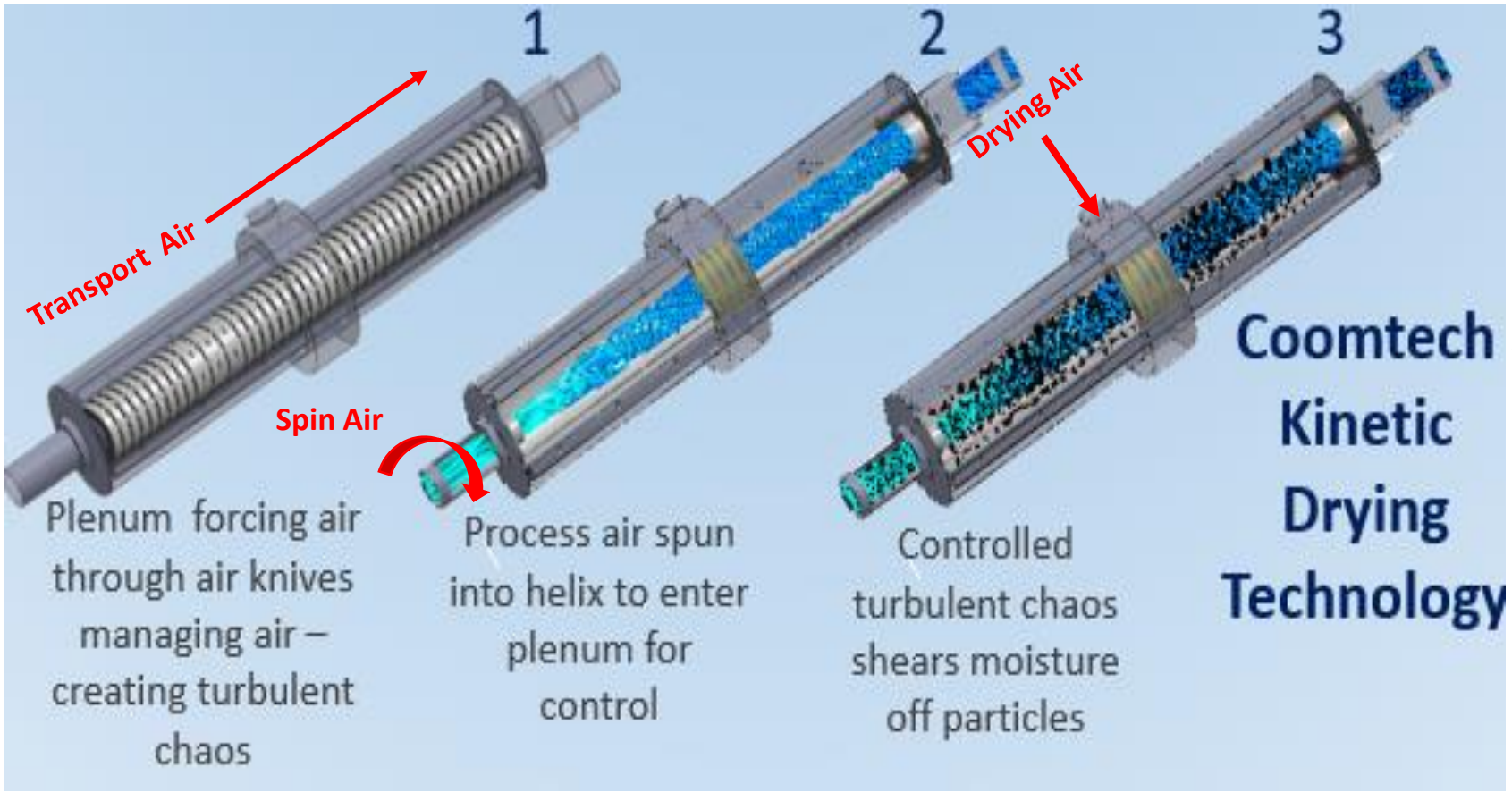
Coomtech SMR Kinetic Technology

Key Features

- The ability of managed turbulent air to shear moisture from particles
- The transport of that moisture in separation through the system in an average 85^0C
- Passage of a particle in 0.75 seconds
- Lean phase material feed at optimal ≤5mm
- Examples: Sands from 8% to 0.1% or PFA - 18 % moisture down to <0.5% by weight
- Minimal moving parts

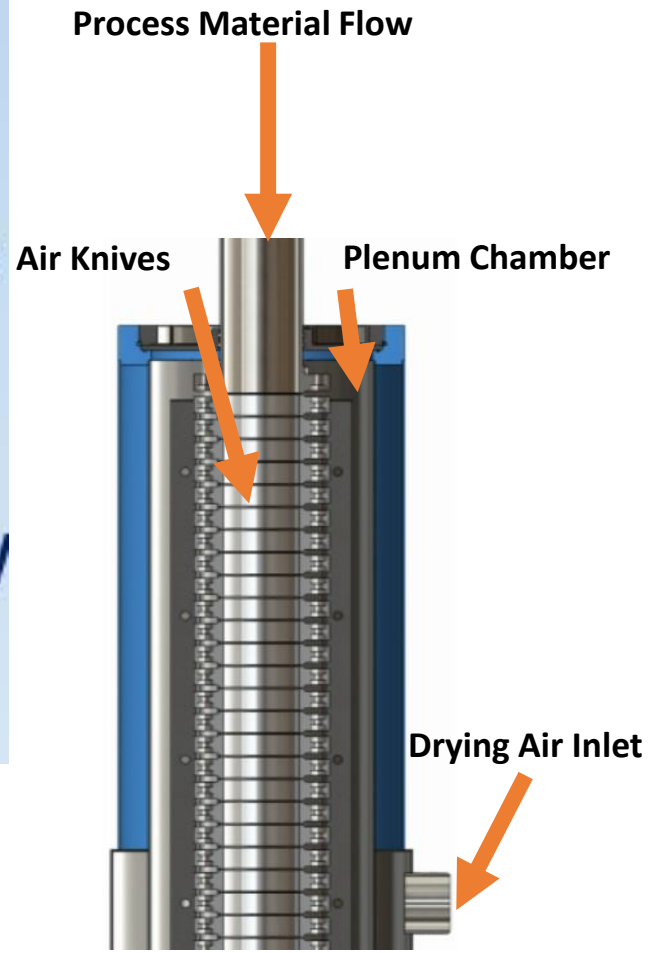


The Drying Cartridge



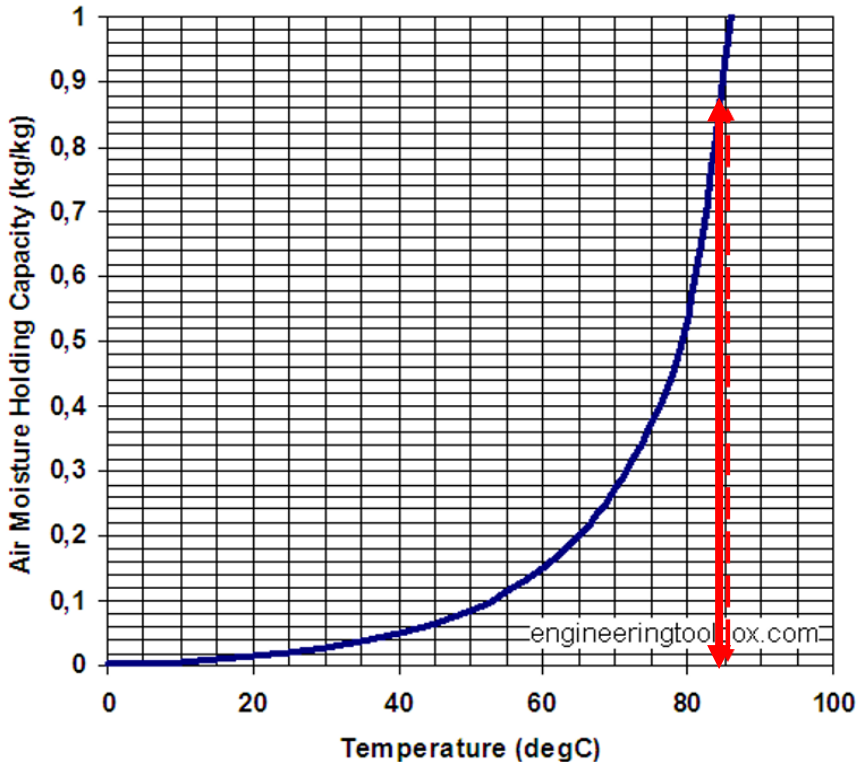
The Drying Process

Plenum & Air Knife Design

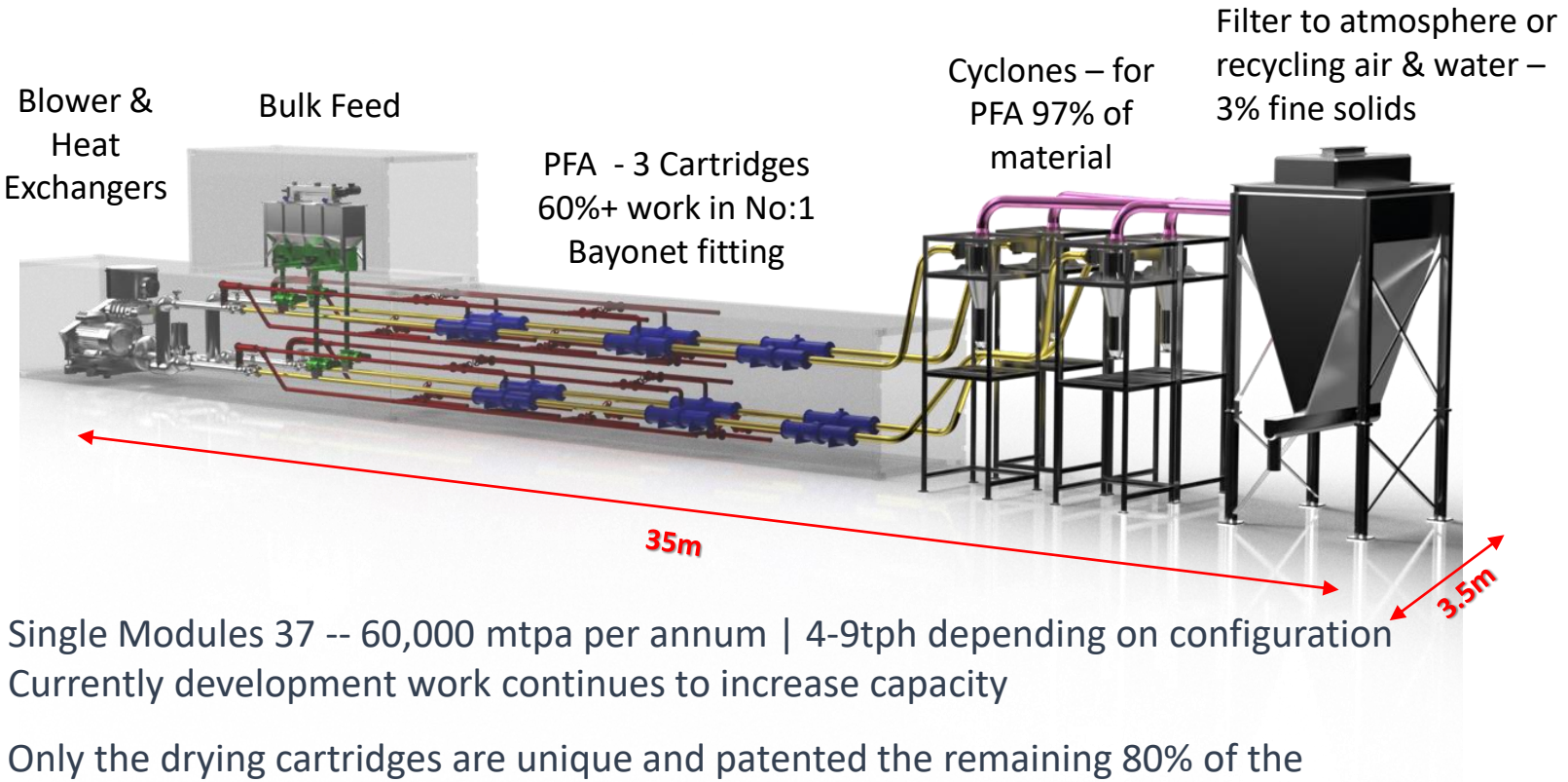


Moisture Management

- To retain moisture separation it must stay above the dew point and in the air stream
- The optimum economic temperature for this water retention is an average of 85^0C
- At this temperature Low Grade Waste Heat can be used as primary energy source
- Exit temperatures for the ash - circa 44^0C-45^0C
- Air and moisture go to atmosphere OR to recovery and recycling



Modular & Site-Specific Design Options



Single Modules 37 -- 60,000 mtpa per annum | 4-9tph depending on configuration
Currently development work continues to increase capacity

Only the drying cartridges are unique and patented the remaining 80% of the hardware comes off-the-shelf from globally recognised suppliers

Energy Options –

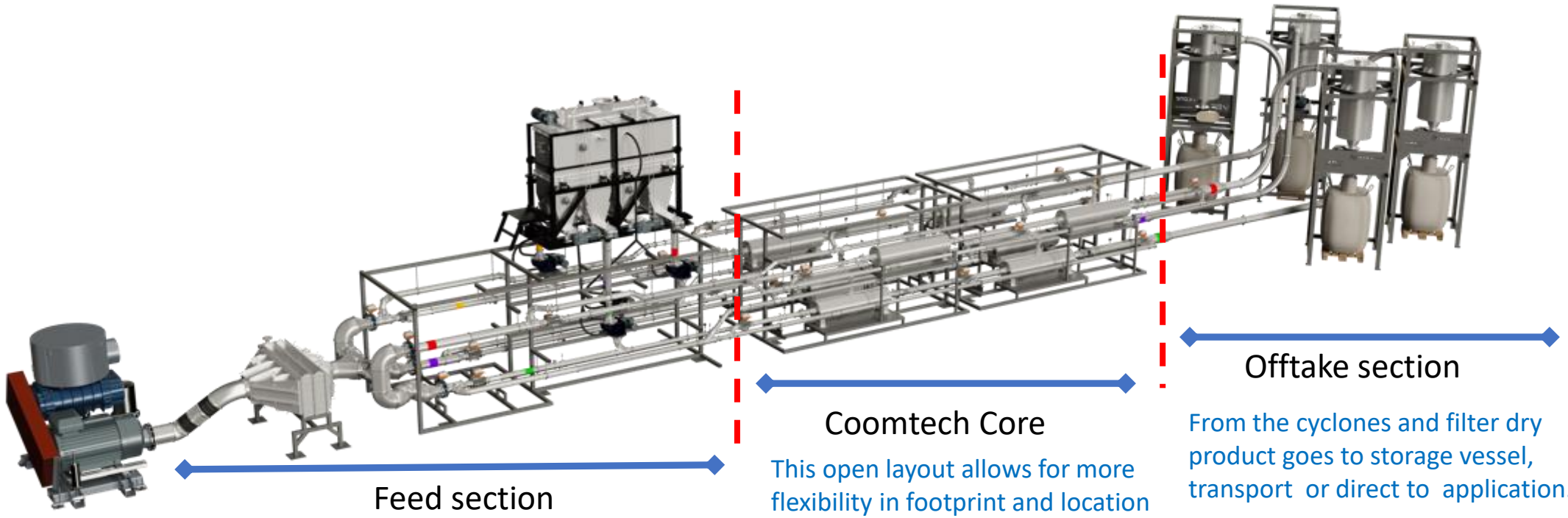
- Electric & Gas (CHP Option)
- Electric & Low Grade Waste heat (135^0C-145^0C)
- Green energy in future (solar / biofuels biomethane (75% Methane content) / wind)

Demountable containerised option

Module = pilot plant later integratable

Pilot enables client to do customer testing , Standards Certification all pre main investment / installation

Layout For Frame Mounted Coomtech System



Feed section

This design is either inserted in to containers or can be mounted in a suitable building containing the feedstock preparation etc. We recommend a well ventilated agricultural style shed with slatted sides and a clear roof as part of the feedstock preparation process.

Coomtech Core

This open layout allows for more flexibility in footprint and location than the containerised version.

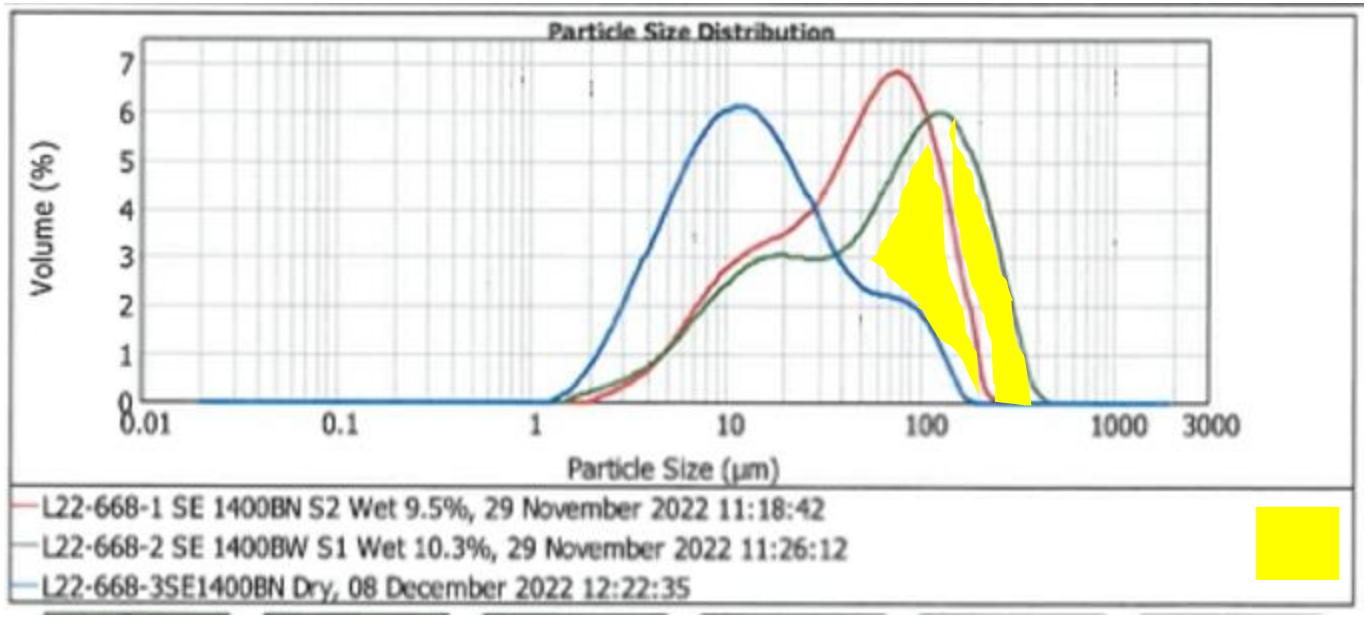
Depending on the product drying this module then connects to cyclones as required and filter unit for fines .

Offtake section

From the cyclones and filter dry product goes to storage vessel, transport or direct to application.

Coomtech & Particle Size Distribution

- Delivered material size specification for the Coomtech drying process ≤5mm from source.
  - For example, the UK / EU specification for PFA EN450 has two sub classes - EN450 N & EN450 S a premium finer material
  - Fine grade and specialist sands for premium applications versus standard applications in construction
- Coomtech breaks up agglomerates and drives PSD to the finer end to the extent that can be seen on these trials below – using harvested PFA from a client source.

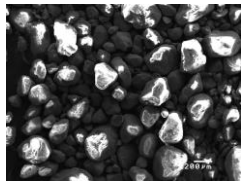


Yellow Highlight = the areas where deagglomeration has pushed the PSD to the finer end – Green Line post drying

Performance and Benefits

Sands & Limestones

Coarse Angular Sand



- Pre-processing moisture: 3-4%TM
- Post processing moisture: 0.1% TM (client target)
- Thermal Drying Energy: 12.47kWh/tonne
- Coomtech Drying Energy: 7.5kWh/tonne
- **Saving 4.97lWh/tonne = 40%**

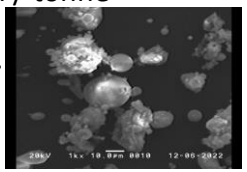
Limestone Fines – target 0.5%

- Moisture In:3% Moisture Out:0.1%
- Energy: Coomtech Maximum per tonne processed = **11kWh/tonne Coomtech dried versus 36.65 kWh now (70% Saved)**
- CO2 Emissions : Maximum per tonne processed **= 5kg CO2 per tonne Coomtech dried versus 7.42 kg CO2 now (33% Saved)**

Harvested PFA

Harvested PFA ex USA – for blending dry at 0.5%TM

- Moisture In:15%TM Moisture Out:0.5%TM
- Thermal energy drying 147 kWh / tonne
- Coomtech energy drying 45kWh / tonne
- **Saving: 102 kWh = 69%**



Harvested PFA ex India – for kiln feed at 3%

- Moisture In:15%TM Moisture Out:3%TM
- Thermal energy drying 85.32kWh / tonne
- Coomtech energy drying 45kWh / tonne
- **Saving: 40.32 kWh = 47%**

- **NOTE: Assuming 27%TM harvested for both above examples further kWh of energy would be saved by the Coomtech wholistic pre=preparation process for harvested PFA increasing savings to:**

@ 0.5% TM = Saves 180.75kWh = 82%

@ 3.0% TM = Saves 119.07 kWh = 63.7%

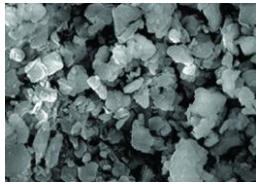
Other Materials

Lignite for hydrogen production target <29%TM

- Moisture In:54% Moisture Out:<29%TM
- Thermal energy drying 180 kWh / tonne
- Coomtech energy drying 35kWh / tonne
- **Saving: 145 kWh = 81%**

GBFS - for cement blending target 0.5%TM

- Moisture In:8% Moisture Out:0.5%TM
- Thermal energy drying 62.14kWh / tonne
- Coomtech energy drying kWh / tonne
- **Saving: 145 kWh = 81%**



See the SMR in action at our Adlington, UK plant

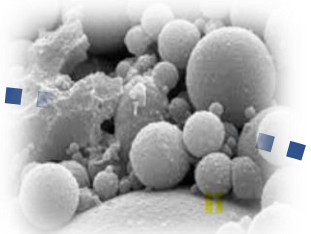
- Trial samples can be tested and visits arranged at our Adlington, UK, R&D facility.
- We prepare a full engineer's report on trials, including energy, CO2 and lifecycle cost figures.
- Our engineers can specify an SMR to suit your application

One of 2 development and pilot lines available for materials testing in the UK

What can we do for the cementitious industries?

Limestone

Ground Blast Furnace Slag



Pulverised Fuel Ash (PFA)

Sands

Calcined crushed shale

Are you using OR considering any of these or similar materials to green your products?

Coomtech will dry them with up to 75% less energy and emissions than traditional drying technologies.

Crushed Basalt

Silica Fume

Gypsum Combustion By-product

Metakaolin

Natural Pozzolans

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