



# Energy monitoring at the BioComposites Centre

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## Background on Centre

- Focused on applied research related to bio-materials and bio-based economy
- Established for 25 years
- Funding from competitive bids and commercial
- Low impact materials, bio-refining, green chemistry



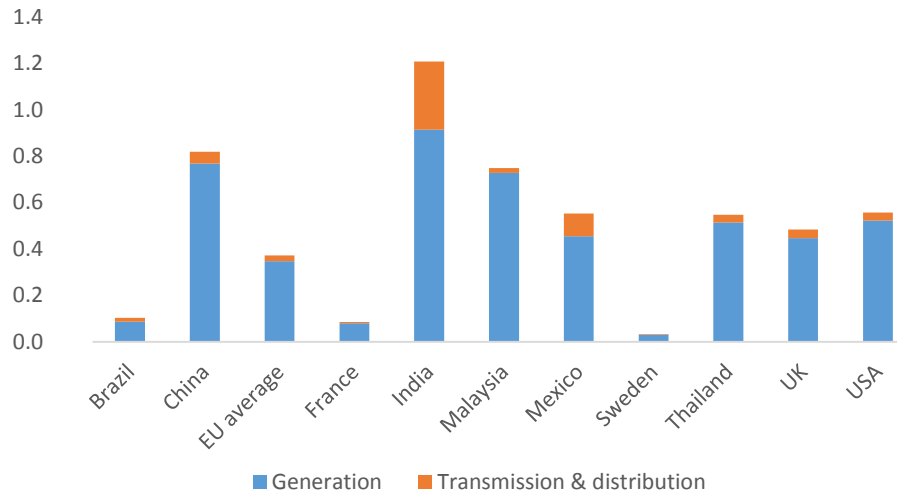
## LCA

- SimaPro / Ecoinvent
- Bio-resins, bio-preserved, composites
- Limited data for additives / novel materials
- Specialist chemicals
- Novel / emerging processing techniques



# Process energy across different national grids

GHGs associated with consumption of 1 kWh grid electricity, by country (2013)



# Biorefining Technology Transfer Centre



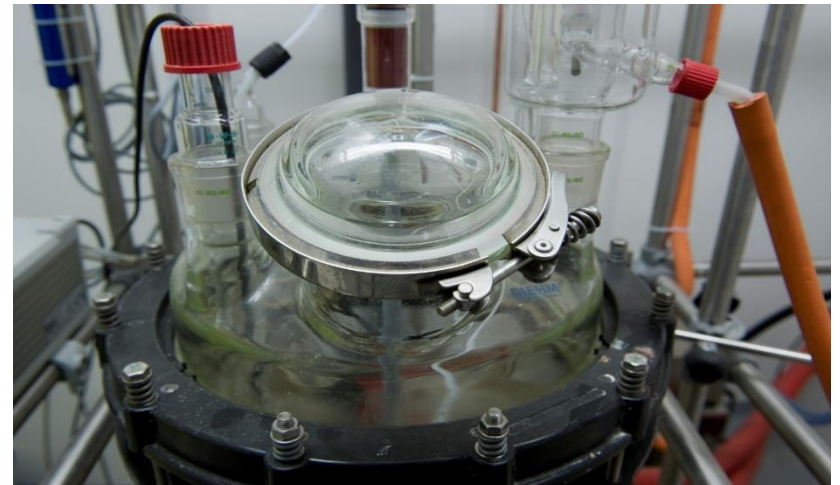
Fractionation line



Pulp moulder



Twin screw extrusion line



Wet chemistry

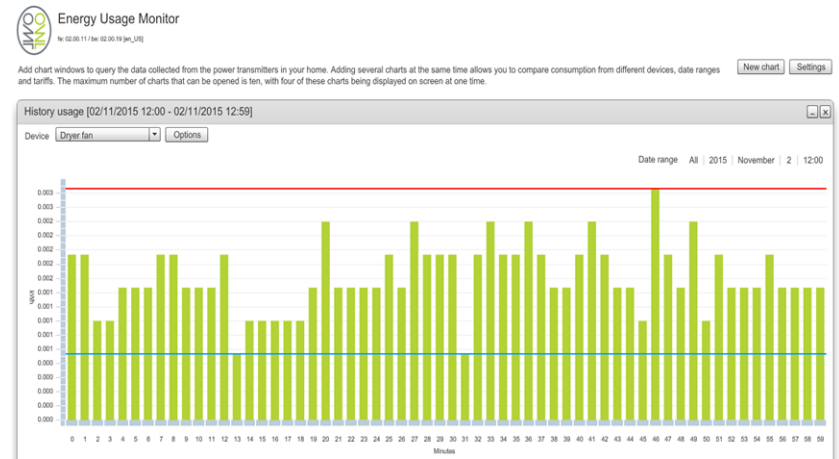


# Biorefining Technology Transfer Centre

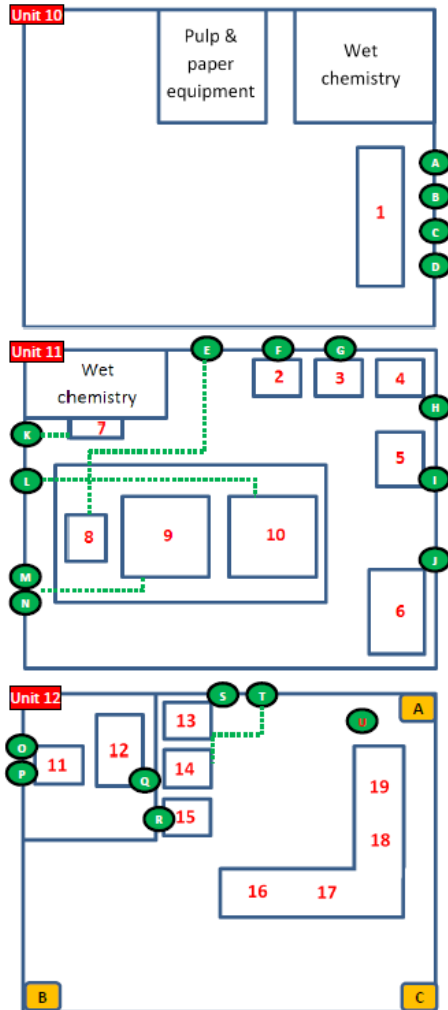


Pressurised refiner & hot press

# Energy monitoring equipment hard-wired to all pilot-scale machinery



# Pilot plant e-monitoring floor plan



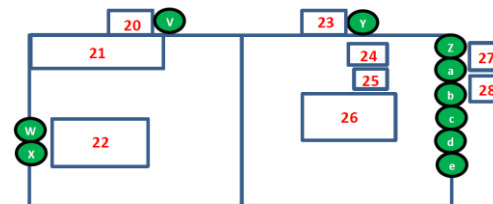
● All supplies (excl. those in wet chemistry lab) are 3 phase

- A = Gas supply in
- B = Unit 12 mains in
- C = Generator supply in

● U Work planned to upgrade supply to refining equipment - includes built-in monitoring capability.



Wet Chemistry





# Single and 3 Phase portable electrical connectors with transmitters

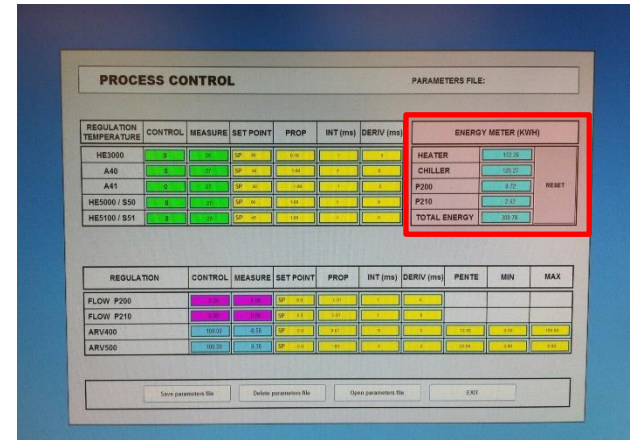


# Other solutions

1- Plug-in monitors:

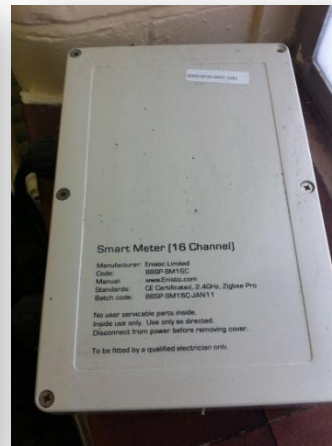
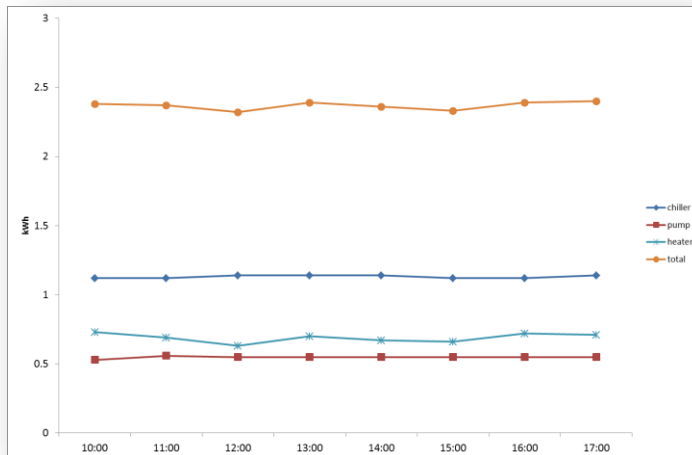


3. Built-in software (Separex)



2- Enistic Energy Management Service →

- clamps, sensors, smart box and controller
- accessed online



## Example: pressurised refining

MDF, production of  
RER / RoW

Ecoinvent, Werner et al, 2007

Wood preparation

Board shaping

Board finishing

Rivela et al, 2007

Wood preparation

Drying

Board shaping

Board finishing

Athena, 2013



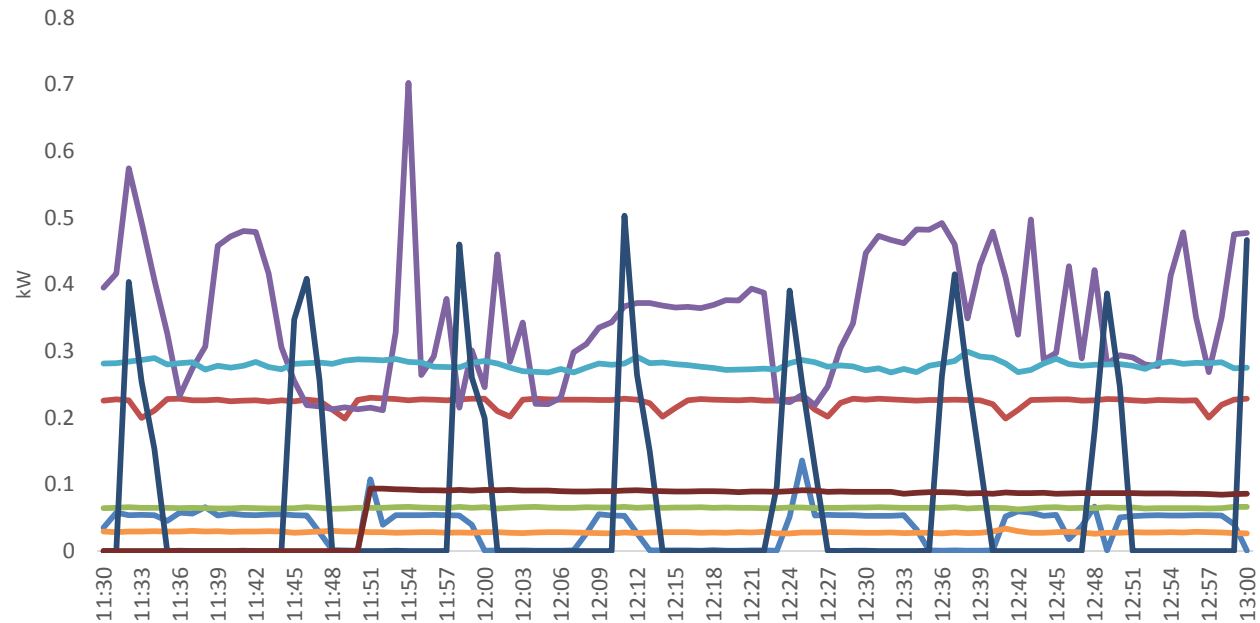
## Example: pressurised refining

- Which are the key elements within the refining process?
- How does varying refining conditions affect energy consumption and yield?
- What is the collective effect of ancillary machinery?
- Energy across different feedstocks?





# Energy flow visible / analysable at greater granularity:



## Next steps / challenges

- Other energy – natural gas metering
- Scale-up
- Industrial partnering, following feasibility demonstration
- Novel / rare materials, chemicals



## References

- Athena (2013) A cradle-to-gate life cycle assessment of Canadian medium density fibreboard (MDF), 2013 update. Athena Sustainable Materials Institute, Ottawa, Canada
- DEFRA (2015) Greenhouse gas conversion factor repository. <http://www.ukconversionfactorscarbonsmart.co.uk/> Accessed 10/11/15
- Rivela B, Moreira MT, Feijoo G (2007) Life Cycle Inventory of Medium Density Fibreboard *Int J Life Cycle Assess* 12(3):143-150
- Werner F, Althaus H-J, Künniger T, Richter K (2007) Life cycle inventories of wood as fuel and construction material.ecoinvent report no. 9. Swiss Centre for Life Cycle Inventories, Dübendorf, Switzerland





Thank you

