

Maximize energy production and minimize emissions at the CPO Mill of the future

ECN Malaysia

Levien de Legé

Kuala Lumpur, 11-10-2016

Mill of the Future is also a Power Plant

- maximum profitability
- maximum palm oil production
- maximum use of (waste) materials
- maximum energy production
- maximum energy efficiency

but

- minimum GHG emissions
- minimum smoke emissions

New “energy” products:

- Solid Bio fuels (black pellets and PKS)
- Biogas (CNG/LNG)
- Electricity
- Heat

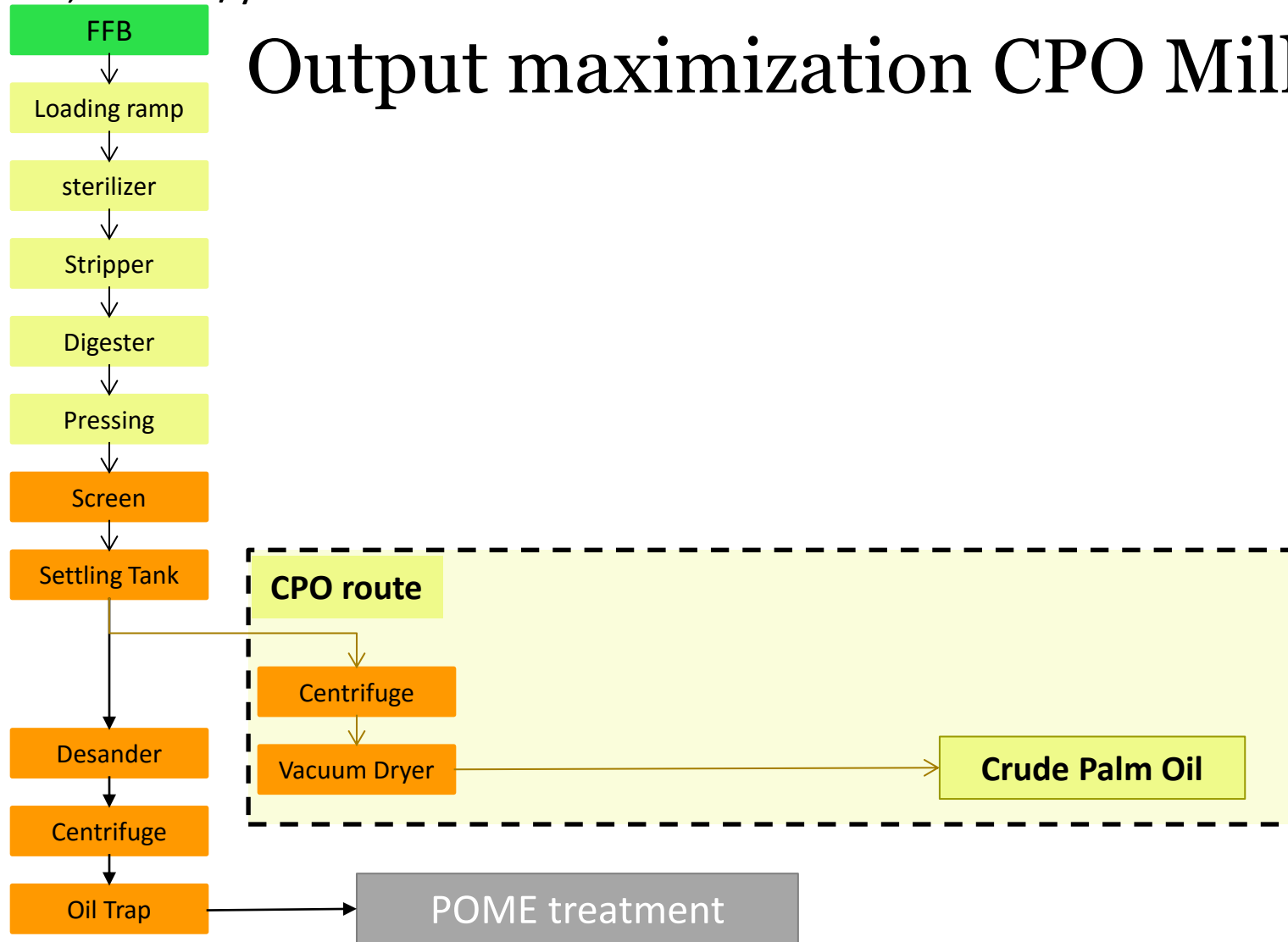
But also:

- Clean drinking water
- Cooling
- Energy storage
- Heat re-use

Important for Rural Development

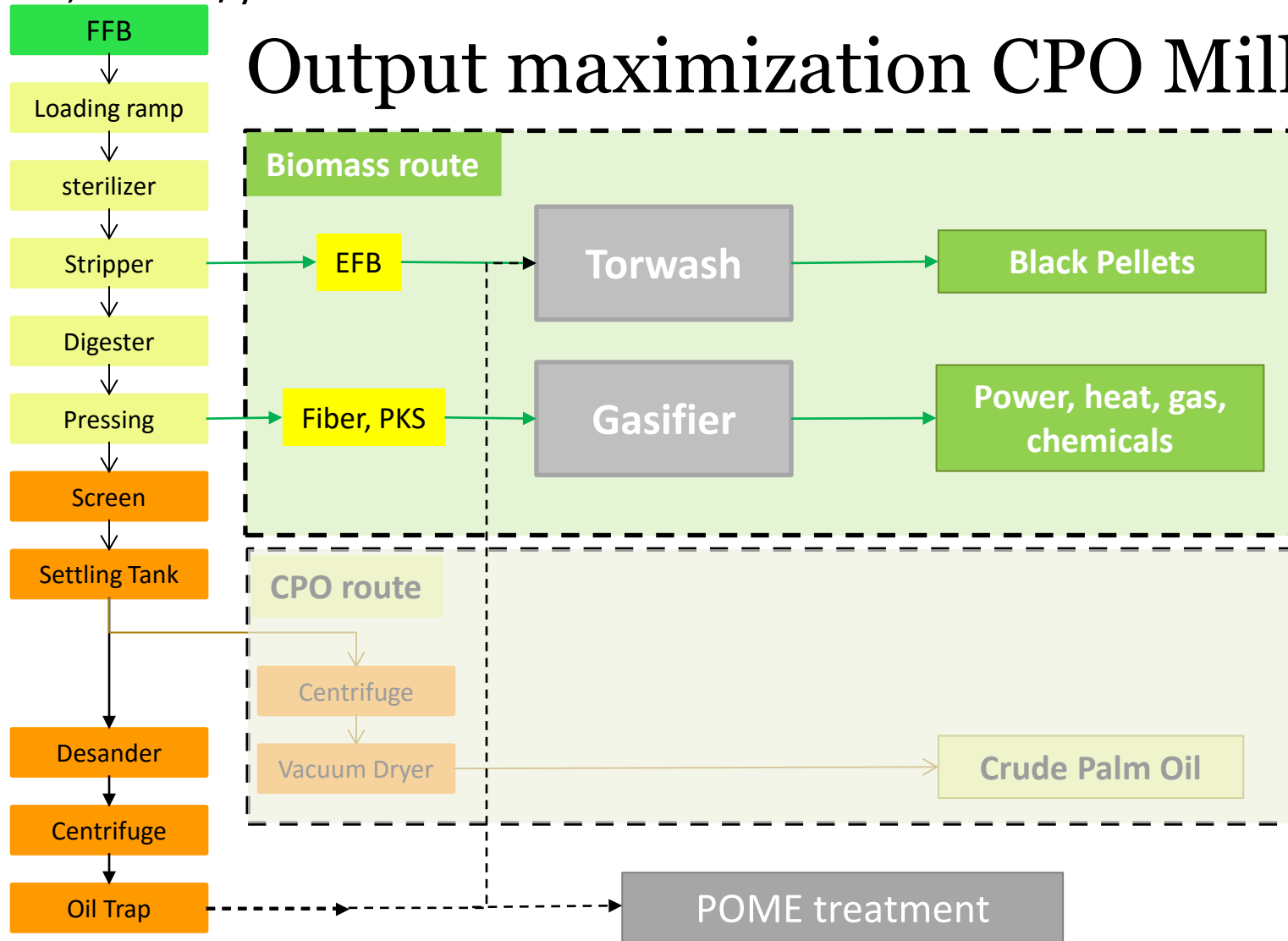
400,000 ton/y

Output maximization CPO Mill ECN



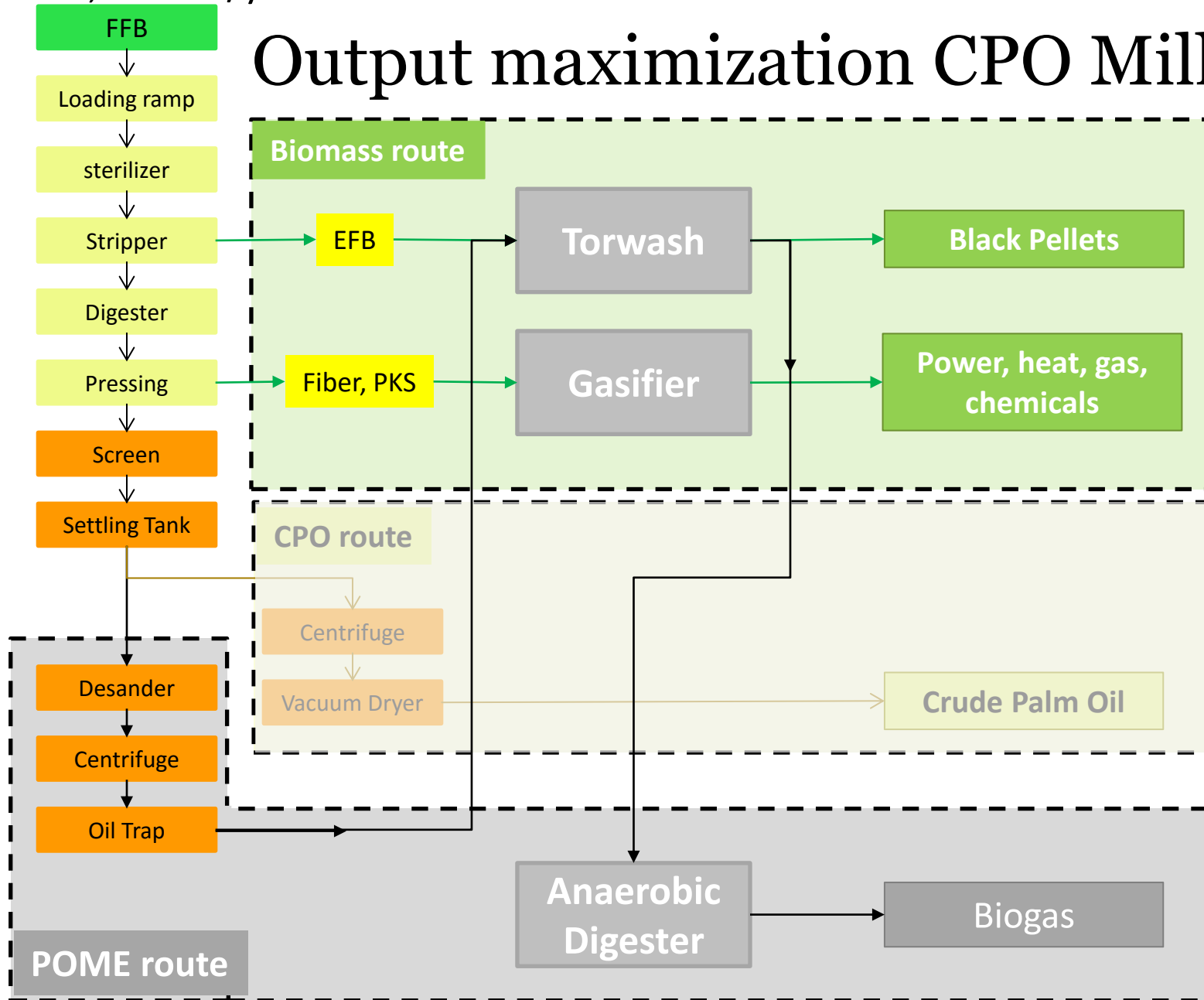
400,000 ton/y

Output maximization CPO Mill



400,000 ton/y

Output maximization CPO Mill



Biomass route

Torwash

- Wet Torrefaction of EFB
- Clean Black Pellets (same quality as wood pellets)
- 25,000 MT per year (2 M\$ additional revenues)

Gasifier

- Indirect gasification
- Up to 33% electric efficiency (using gas turbine)
- Syngas production: heat/power, methane, bio refinery

POME route

Anaerobic
digestion

Biogas
upgrading

- Torwash removes solids from POME
- Very highly efficient digestion due to low solid content
- Biogas creates additional revenues

CPO Mill as power plant for Rural Development in Malaysia



Fuels, Power and Heat:

- Solid Bio fuels (black pellets and PKS)
- Biogas (CNG/LNG)
- Electricity
- Heat

Constraints for Malaysia:

- Electrical grid
- CNG supply chain
- RE subsidy system
- Investment funding

But also:

- Clean drinking water
- Cooling
- Energy storage
- Heat re-use

Thank you for your attention

ECN Malaysia

Levien de Legé

M +60 17 712 2905

E delege@ecn.nl