Process integration in industry for cost-effective greenhouse gas reduction

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Identification of cost-effective measure packages for industrial GHG mitigations is now possible. A method accounting for (i) complex interplay between measures for existing plants and (ii) possible GHG effects off-site has been developed.

Options for GHG mitigation

Within a process plant combustion of fuel is the main source of GHG emissions. Mitigation measures should thus preferably be taken in the industrial energy system. Options are:

- Increased heat recovery
- Integration of CHP systems
- Heat pumping
- Process modifications
- Fuel switching

Experiences

With the method, cost-effective significant GHG reduction options can be targeted.

Combinations of measures are mostly more attractive than single measures.

Predominant factors for the GHG reduction potential are the level of electricity grid emissions, and the current process layout.

For results interpretation most crucial is to have both a well defined system boundary and a carefully chosen emission baseline.

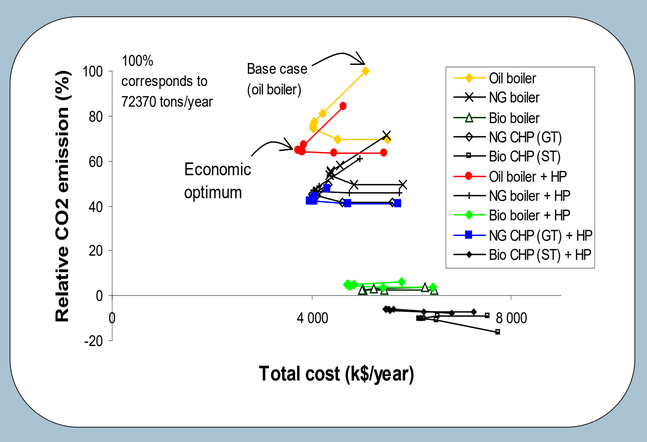

Fig 1. Compiled results graph

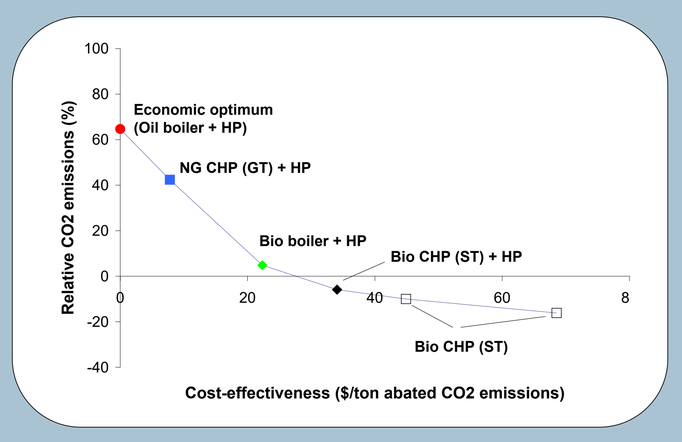

Fig 2. Cost-effectiveness graph

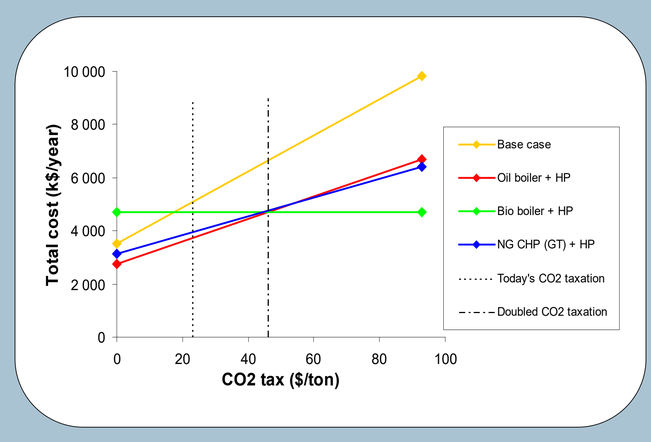

Fig 3. Sensitivity analysis graph

Method

The method is described in brief and exemplified by a case study (Fig 1-3).

1. Define system boundary and baselines.
2. Retrofit the heat exchanger network.
3. Report cost minimized solution and GHG emission reductions at heat saving levels defined (yellow curve in Fig 1).
4. Repeat for any additional measure considered (other curves in Fig 1).
5. Identify the overall cost minimized solution (point on red curve Fig 1).
6. Identify cost-effective alternatives (Fig 2).
7. Perform sensitivity analysis (Fig 3).

→ Input for industrial or policy-making decision

Information

Questions are most welcome. One might perhaps wonder how a GHG emission reduction of more than 100% is possible (Fig 1.).

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