

Production of hexane requires 64 MJ/kg of energy; distillation returns 46 MJ/kg and incineration returns 55 MJ/kg. Which route is more energy efficient and what is the cumulative energy demand?

- a) Incineration, 119 MJ/kg
- b) Incineration, 9 MJ/kg**
- c) Recycling, 119 MJ/kg
- d) Recycling, 18 MJ/kg
- e) Equal, 101 MJ/kg

Cumulative energy demand (CED) is the energy required to manufacture a compound minus the energy returned by the treatment: distillation or incineration. In the case of hexane, the energy required to manufacture is 64 MJ/kg, and the energy returned by incineration is higher than that by distillation, which means incineration will give a lower CED (9 MJ/kg) than recycling (18 MJ/kg).

In general, incineration is environmentally favoured for solvents that are easy to manufacture and distillation is environmentally favoured for solvents that are difficult to manufacture. For example, the production energy cost of DMF is about 90 MJ/kg, and incineration returns 25 MJ/kg while distillation returns 57 MJ/kg. The CED for recycling DMF will be much more energy efficient due to the high energy demand in manufacturing of DMF.

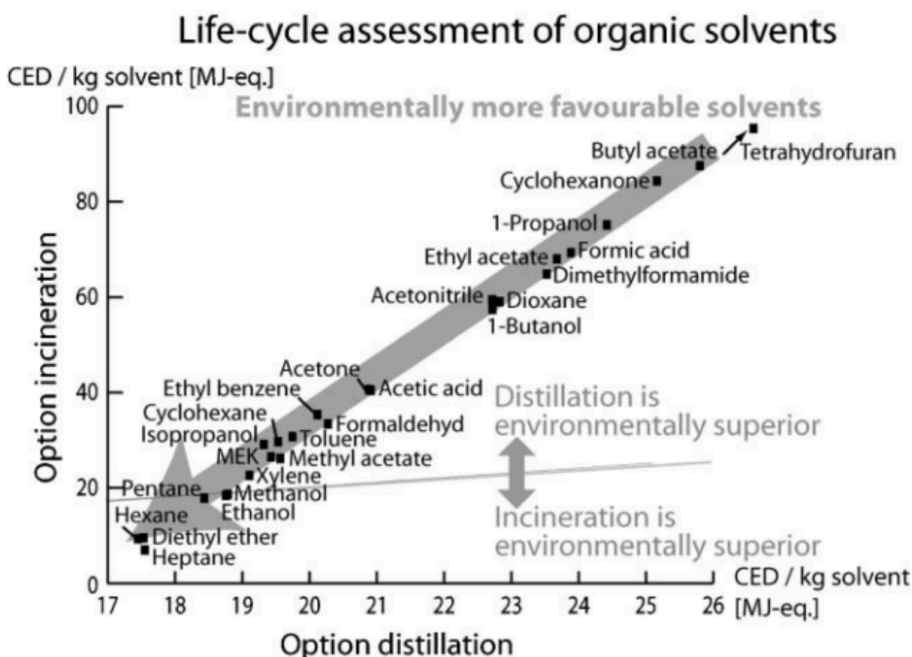


Fig.1 CED/kg solvent for distillation and incineration for various solvents.

Reference

Capello et al., Green Chem (2007) 9, 927