



CARBON FOOTPRINT OF RECYCLED SOLVENTS

Chemical Recycling: Sustainability in Practice

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TRADEBE CHEMICALS

ABOUT US

Tradebe is a specialist producer and distributor of quality-approved fine and specialty chemicals throughout the UK, Europe and worldwide.

We have a wealth of experience and a strong knowledgeable team of chemical specialists, together with adaptable plants. We efficiently meet the current and future needs of our customers.

We specialise in integrating our Raw Material recycling and Production into the Value Chain of our customers in order to make it more sustainable and cost effective

- International chemical producer & distributor
- Supplier of fine & specialty chemicals
- Technically advanced research & development team
- Analytical development laboratories and lab-to-plant capabilities
- Flexible chemical processing sites, including batch & continuous; complex & multi-step
- Variety of reaction vessels, including steel, glass lined and pressurised
- Standard & bespoke chemical processing to a high specification
- Large worldwide distribution network
- Annually 92kTons of solvents and chemicals sold
- Certified to ISO 9001, ISO 14001 & OHSAS 18001
- REACH Regulated

WHAT WE OFFER

CUSTOM CHEMICALS

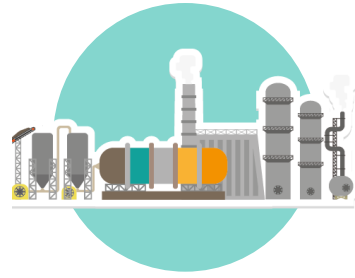
*Research &
Development*



We have a technically advanced, innovative research and development team that can produce chemicals designed for your process requirements and we can offer solutions to raw material provision as well as chemical product purification

CHEMICAL SOURCING

In-House Specialists



Our in-house purchasing team have strong relationship with chemical suppliers across the world. With many years of experience sourcing chemicals at competitive market prices.

CONTRACT & TOLL

*Industrial process & process
Development*



- For chemical products with established formulation, we can offer chemical processing on a contract or TOLL basis.
- We are experienced at upscaling and processing chemicals to a strict specification and our plants are adaptable for producing or processing chemicals to a high specification.
- We can also assist with the optimisation of processes, such as multi-step options
- We can assist in lab –to-scale trials in order to develop and maximise distillation and chemical manufacturing techniques with our customers

OUR CHEMICAL SITES

RYE (UK)

Five flexible distillation units giving a wide ranging solvent recovery capability

- The site has a capacity of circa 35,000 te/yr
- Rye has a unique glass lined reactor and column which gives it the ability to recover organic acids such as acetic acid
- Pharmaceutical toll recovery is core business to this site
- cGMP level 3 certified processes

SUNDERLAND & NORTH TYNE (UK)

One of the UK's premier solvent recovery sites with three high quality distillation units giving a capacity in excess of 60,000 te/yr

Specialises in high quality solvent recoveries including high value solvents such as THF, 2-MeTHF; NMP and others

SCHWARZHEIDE (GERMANY)

Expected operations to begin in 2020

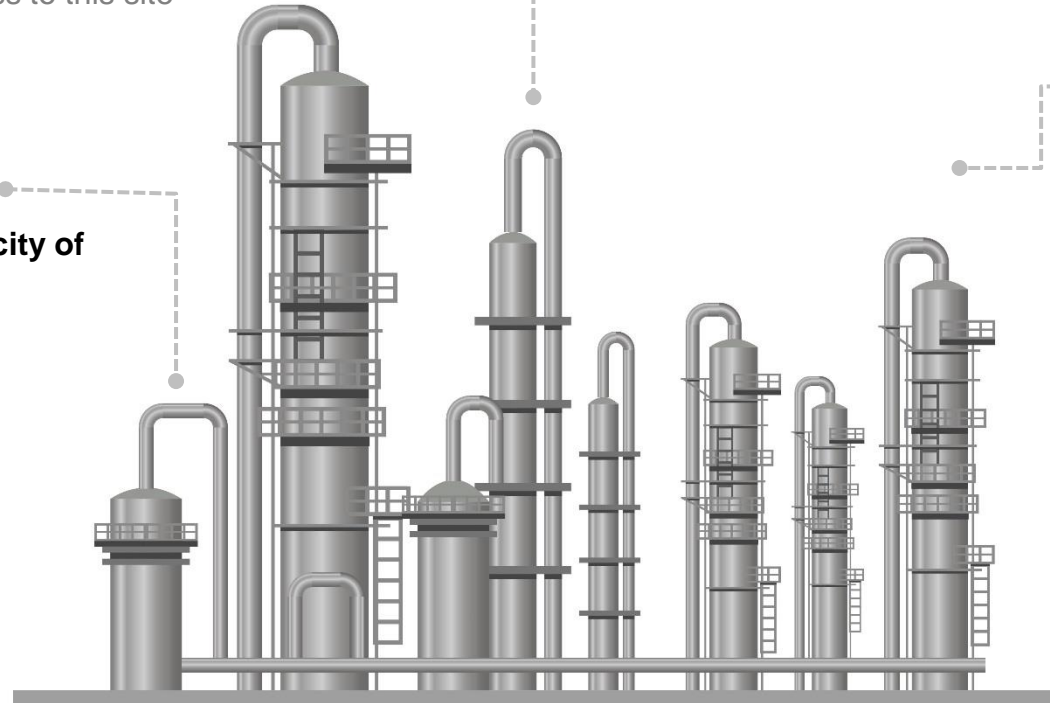
GUALBA (SPAIN)

Five flexible batch distillation units. Capacity of circa 20,000 te/yr

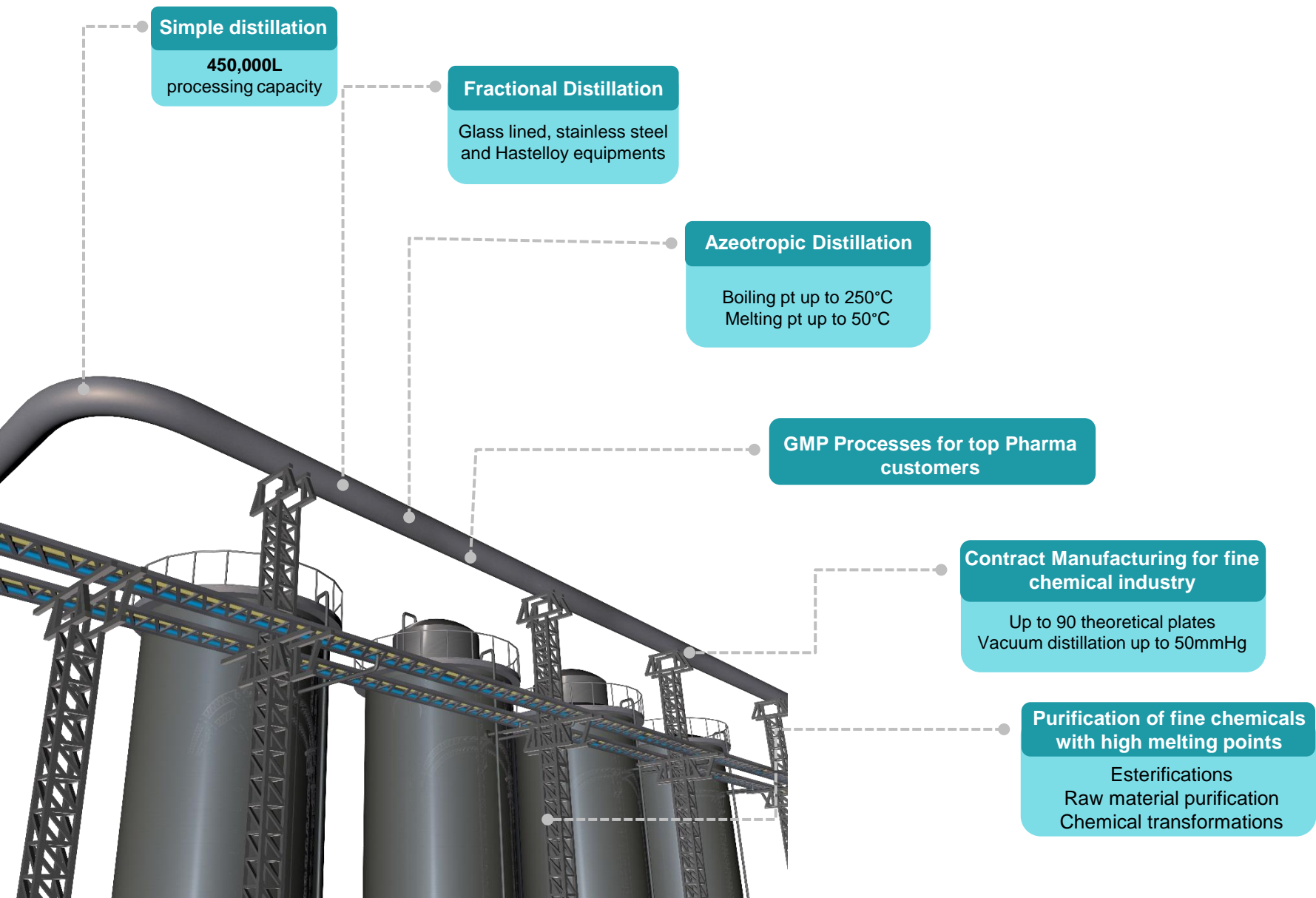
- Simple distillation
- Fractional Distillation
- Azeotropic Distillation
- Purification of fine chemicals
- Upgrading of virgin products
- Preparation of reactives for pharma industry
- cGMP Processes with main pharma companies

FIDENZA (ITALY)

Expected operations to begin 2019 end



TECHNICAL CAPABILITIES



- Recognition of increasing importance of businesses understanding and managing carbon footprint
- 2006 ISO 14044 Lifecycle Assessment Methodology published
- 2007 – 2010 Tradebe (then SRM) supported Manchester University (Prof Adisa Azapagic) in the development of a Lifecycle Assessment Tool

CCalc Developed:

- ✓ Multi-award winning life cycle methodology and decision support tool for Industrial Users.
- ✓ Large Database with >6,000 data items
- ✓ Now in 2nd Generation (www.ccalc.org.uk) with extended sector coverage



- 2012 / 2013 Tradebe took part in a first Carbon Footprinting Study commissioned by its European Trade Association, the European Solvent Recyclers Group.
- 2018 updated at Sectoral Level
- 2015 – 2019 Tradebe trained inhouse staff, to support Chemical Customers sustainability data requirements (CSR Reporting) and decision making.

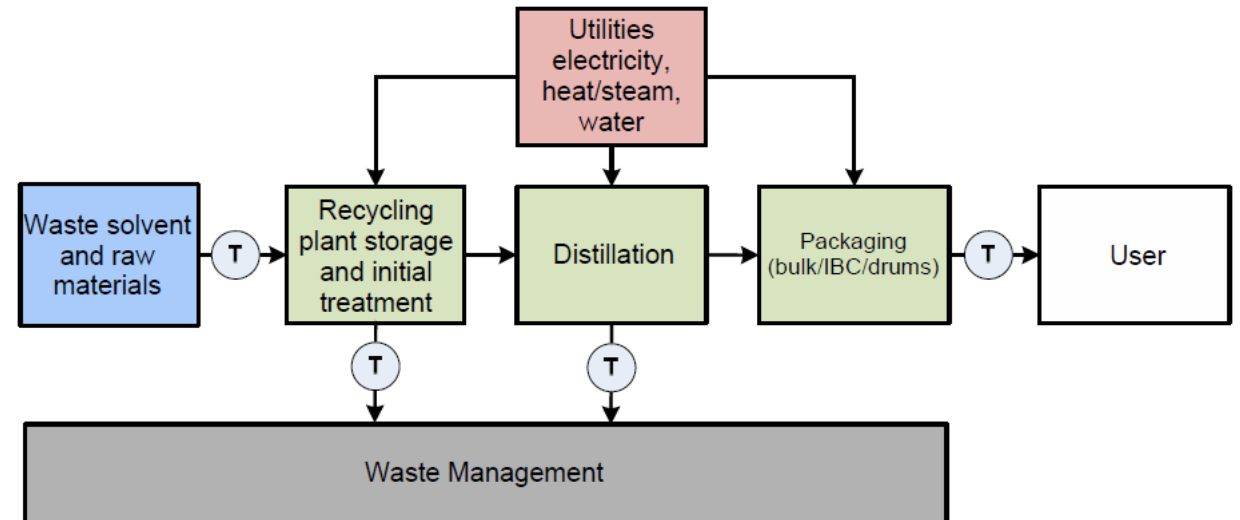
Database shows inherent carbon intensity of chemicals

- Example Toluene: 1,500 kg CO₂ eq per 1,000kg Toluene manufactured
- More complex molecules significantly higher
- Significant carbon savings potential of recycling



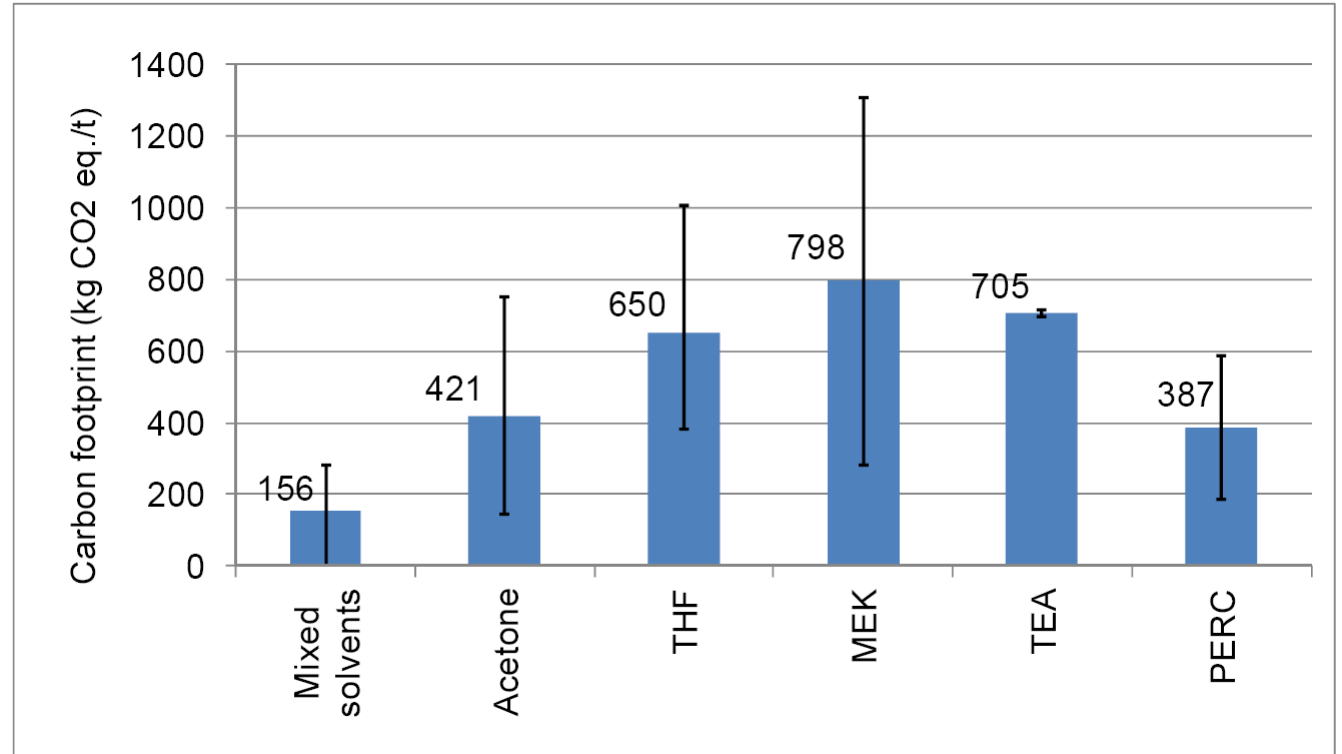
STUDY BOUNDARIES & DATA

- Commonly recycled solvents, representative of varying types, processes.
- Transport of waste solvent and raw materials to the recycling plant
- Packaging of waste and recycled solvent
- Solvent recycling process
 - electricity, heat/steam, water, in-process waste streams
- Transport of recycled solvent to the user
- Credits for energy recovery, packaging recycling and co-products (if relevant)



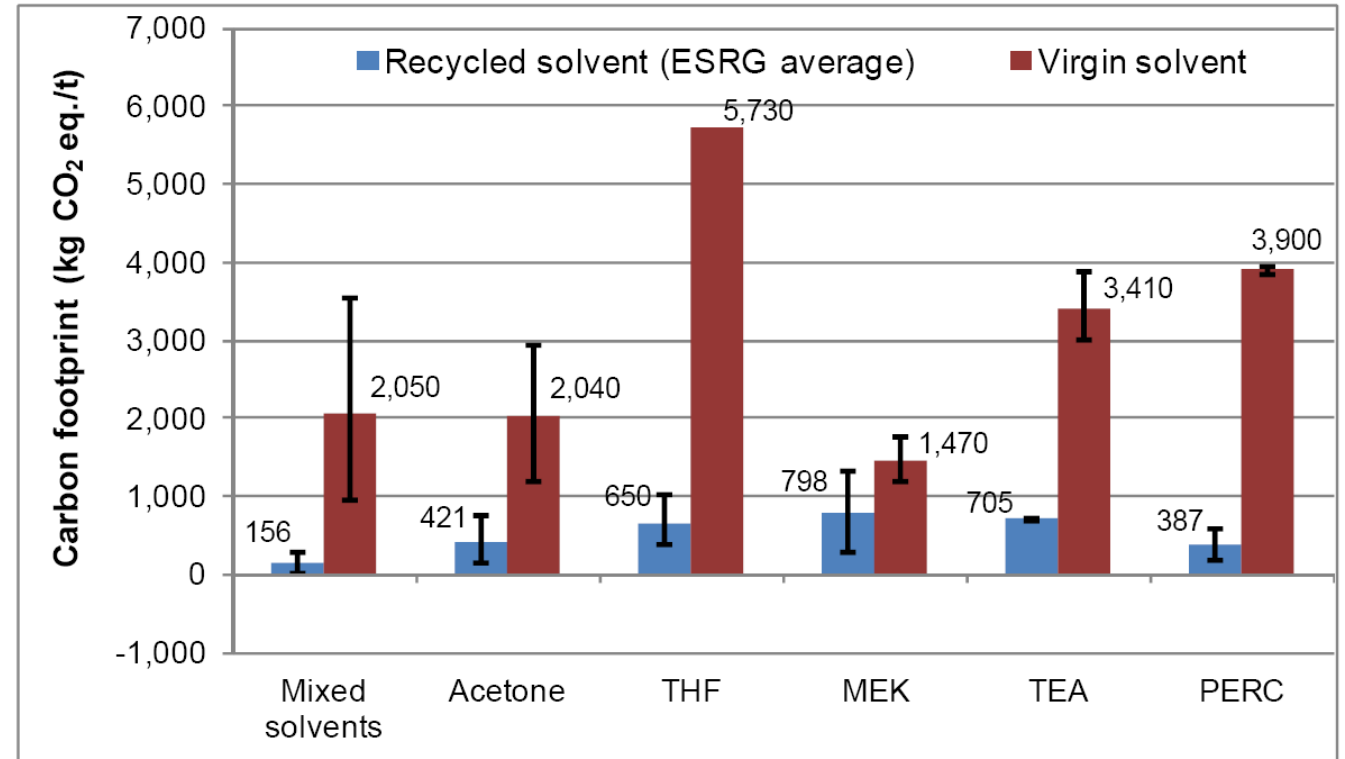
RESULTS

- Average Carbon Footprint of recycled solvents varies from 156 – 798 kg CO₂ eq./t.
- The main contributor to this footprint varies, mixed solvents and Perc are transport and packaging sensitive, others' carbon footprint is dominated by the recycling process itself.



RESULTS

- We can then compare the carbon footprint of recycled solvents with their respective virgin solvents
- Even without accounting for multiple recycling loops and the footprint for alternative disposal of the waste solvents, recycling leads to significant savings of greenhouse gas emissions ranging from 46% - 92%.



- Tradebe Chemicals enables Significant Carbon Savings for its customers
- Tradebe Chemicals can quantify savings as CO₂_{eq} to specific product streams or closed-loop recycling streams
- Tradebe Chemicals assessment of Lifecycle Carbon Savings for Customers
 - ✓ Supports CSR Reporting
 - ✓ Supports ISO14001 aspect evaluation
 - ✓ Decision-Making

Examples

- Largest single stream in Tradebe's UK operations (full lifecycle including transport) of **36,000 tonnes CO₂_{eq}** per annum for one single stream closed-loop molecule.
- New Build Tradebe GmbH facility on BASF Schwarzheide site in Germany expected to save **27,000 CO₂_{eq}** in its first year based on a single stream input, prior to expansion.