

# Pinch Analysis in TH4+ process design

## PINCH ANALYSIS

Based on solid thermodynamic principles and supported by intuitive graphical representations, Pinch Analysis is the tool of choice in process engineering to optimize energy integration of new and existing designs.

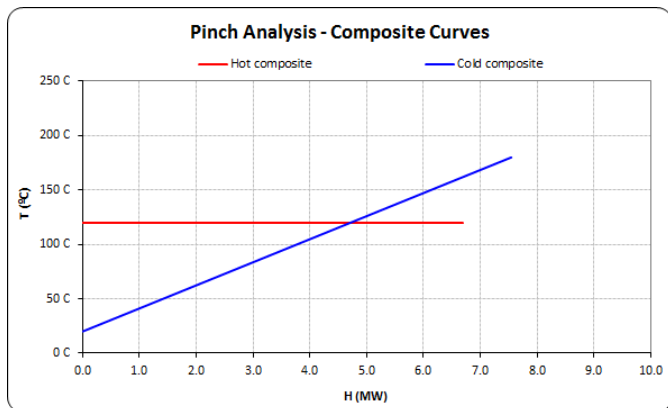
Our TH4+ thermal hydrolysis process has been designed from first principles following Pinch techniques. This maximizes heat recovery and results in lower operating costs.

## THE PROBLEM

As illustrated by the cold composite curve (blue line) in the graph below, the thermal hydrolysis process needs to heat up the sludge from ambient temperature to about 180°C.

Unfortunately, the available heat from the flashed vapours is only at 120°C, as shown by the hot composite curve (red line).

In how this heat availability and demand mismatch is resolved is where the key to optimum heat integration lies.



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## POINTS OF INTEREST

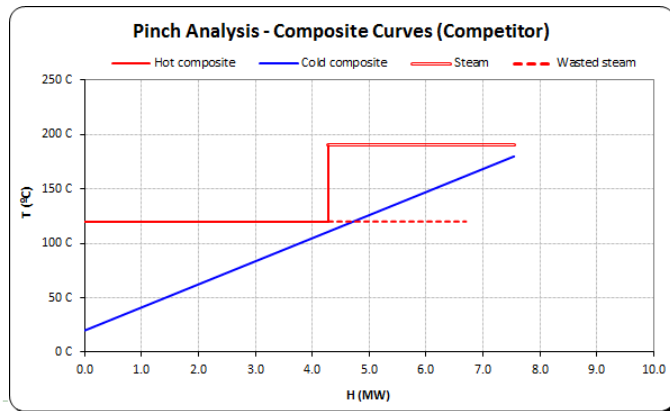
- TH4+ is design using Pinch principles
- Traditional processes waste part of the generated steam
- TH4+ uses all the flashed steam and minimises energy costs
- teCH4+, your partner to squeeze more out of your organic waste



## TRADITIONAL THERMAL HYDROLYSIS SOLUTION

Like most real-life problems, this one entertains several possible solutions. The one traditionally chosen is the most simple one: part of the generated flashed steam is wasted (dotted red line) and the desired sludge temperature is achieved by means of steam generated elsewhere, at a cost.

The extent of that external steam segment (double red line) is proportional to the energy required to operate the process.



*“Designed using Pinch Analysis techniques, the TH4+ thermal hydrolysis process is truly optimised for energy integration”*

### RESOURCEFUL

Our website has a repository of information relevant for thermal hydrolysis, including:

- ⇒ Blog
- ⇒ Videos
- ⇒ Brochures
- ⇒ Publications
- ⇒ Projects

[www.tech4plus.com](http://www.tech4plus.com)

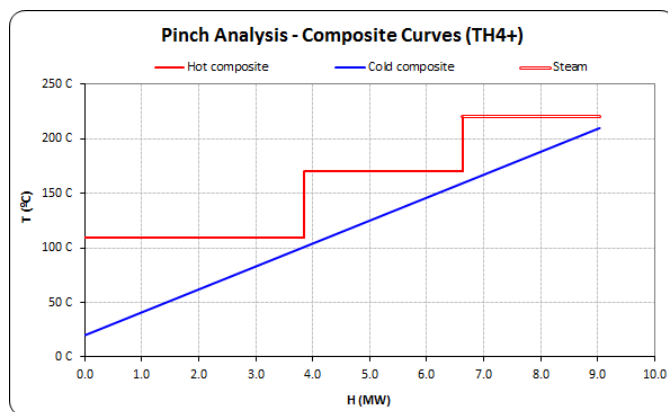
## THE TH4+ SOLUTION

The TH4+ process introduces a novel, self-generated intermediate steam level, that yields two key benefits:

1. All internally generated steam is utilised and no steam is wasted anymore
2. The amount of external steam needed is minimized, and so are the energy costs.

The composite curves below illustrate how the TH4+ process can heat the sludge up to higher temperatures (210°C vs. 180°C in this example) with less steam. In graphical terms, the horizontal double red line section is now shorter than before.

Interestingly, this reduced amount of steam can be generated from the anaerobic digestion biogas, making the process energy self-sufficient.





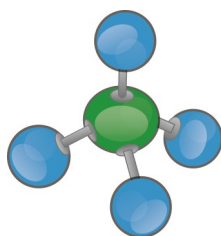
## OUR COMPANY

We are an engineering company with a passion to create and apply world-leading wastewater treatment technologies. In particular, we are an authority in the field of thermal hydrolysis through our TH4+ process.

We have combined our engineering minds with our entrepreneurial inclinations to promote a technology that is second to none, helping our clients increase their profitability. Squeezing more out of their sludge, their benefit is two-fold: increased biogas yield and lower, higher-quality volume of biosolids.

We are firm believers that ingenuity and engineering hold the key to sustainable progress, and we choose to see sludge not as a liability but as an asset that is capable of generating environmentally-friendly, renewable energy.

The teCH4+ logo sums it all up: we are technical people that has created great technology (thus teCH) to take you further and give you a plus (thus 4 + or for plus). And, of course, CH4 is the chemical formula of methane, the main component of biogas and symbolized by the iconic tetrahedral molecule



## VISION, MISSION & VALUES

**Vision:** our vision is to be the world's top provider of thermal hydrolysis technology

**Mission:** we design, install and manage thermal hydrolysis plants, creating value for our clients through robust, innovative and environmentally-friendly technology

**Values:** our Vision and Mission encourages us to be:

- ⇒ Ingenious - create, own and apply innovative technologies that are always one step ahead of our competition
- ⇒ Open - transfer our know-how honestly to our clients anywhere in the world, providing customer-friendly expertise and knowledge
- ⇒ Productive - run an efficient, responsive and agile organization, with lean business processes, that makes it a pleasure to work with and enjoyable to work for.
- ⇒ Profitable - by helping our clients to boost their profitability, we can be profitable ourselves and devote a significant portion of the benefits to research, development and innovation.

## WHY THERMAL HYDROLYSIS?

- ⇒ Enhances biogas yields
- ⇒ Improves biogas quality
- ⇒ Decreases GHG emissions and carbon footprint
- ⇒ Reduces sludge volume, cutting handling costs
- ⇒ Improves sludge quality producing pathogen-free, odour-less biosolids
- ⇒ Enables a foam-free, smoother anaerobic digestion
- ⇒ Debottlenecks existing digesters, doubling their loading capacity and avoiding significant capital expenditure

## WHAT IS THERMAL HYDROLYSIS?

Thermal hydrolysis is a pre-treatment to the conventional anaerobic digestion of organic waste. In general terms, it is a two-stage process:

1. The sludge is heated up under high-pressure conditions
2. The high-pressure material is flashed

This combined action fractures the cell structure and makes the waste more biodegradable, improving the anaerobic digestion performance and yielding more biogas.

In addition, thermal hydrolysis sterilizes the sludge. The destruction of pathogens, or pasteurization, results in high-quality sludge that is suitable for land application as fertilizer or compost even under the most stringent regulations.

Finally, this pre-treatment adjusts the rheology of the material to such an extent that loading rates to the anaerobic digester can be doubled. The dewaterability of the sludge is also significantly improved to up to 40% total dry solids, resulting in less biosolids.

While research and development of this technology started back in the 90s, the technology has come long ways since evolving from the initial batch processes into the cutting-edge TH4+ process.

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