



# Thermal Hydrolysis Processes

- Reduces sludge volume
- Improves sludge quality
- Increases biogas production



## Thermal Hydrolysis Processes

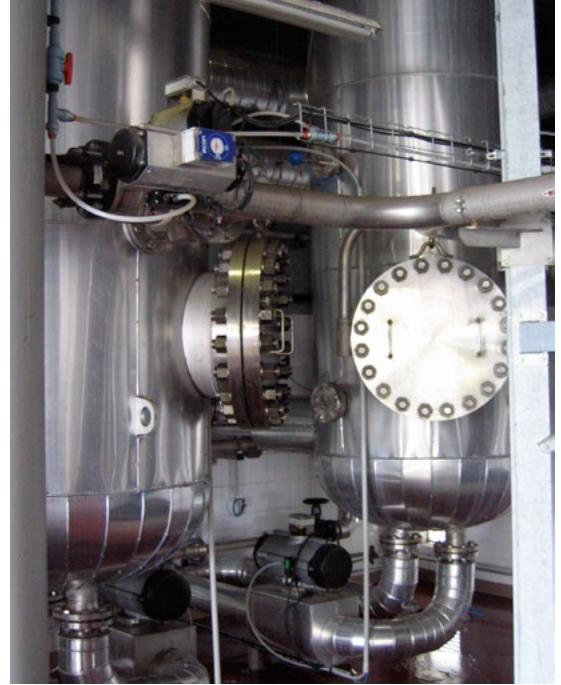
**Bio Thelys™** is a complete sludge reduction solution that works in batch mode, combining thermal hydrolysis and anaerobic digestion.

**Exelys™** is an innovative and complete sludge reduction solution that works in continuous mode.

By coupling thermal hydrolysis with anaerobic digestion, Bio Thelys and Exelys offer enhanced performance over conventional digestion and optimize sludge treatment by producing:

- 25 to 35% less dry solids
- 30 to 50% more biogas
- No odours
- A safe, high quality product for land application.

Both are able to process a wide range of organic, industrial or municipal sludges, including those containing fats, oils and grease (FOG).



## Benefits

- Reduced digester related investment for new installations
- Reduced operating costs with less sludge to manage
- Income is generated from:
  - Additional energy generated with more biogas
  - Additional capacity to process organic imports

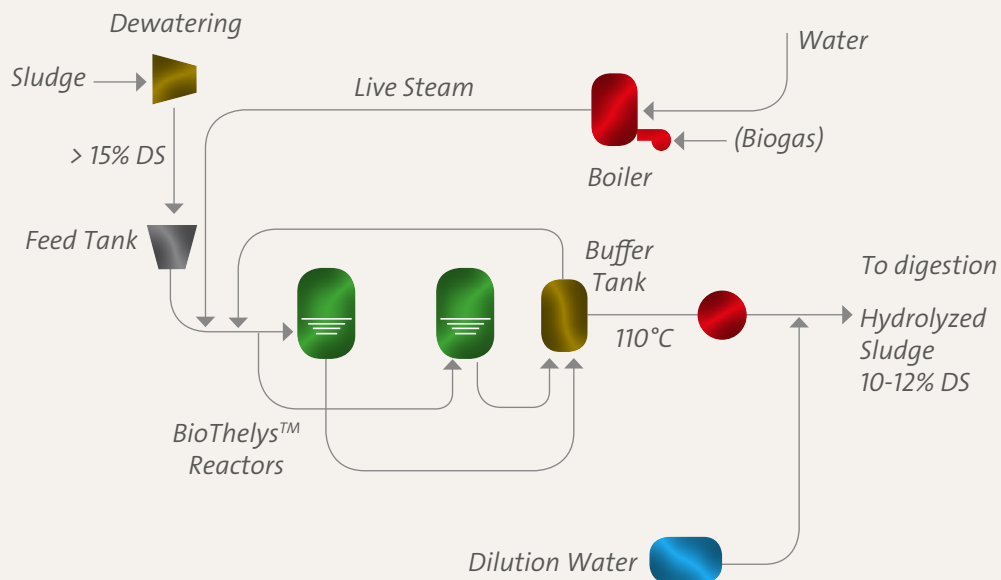
*Higher revenue,  
Lower expenditure*



# Operating Principle

## Bio Thelys

Dewatered sludge first goes through a batch thermal hydrolysis phase during which steam is injected in reactors operating under specific pressure (6-8 bars) and temperature (165°C) conditions for approximately 30 minutes.

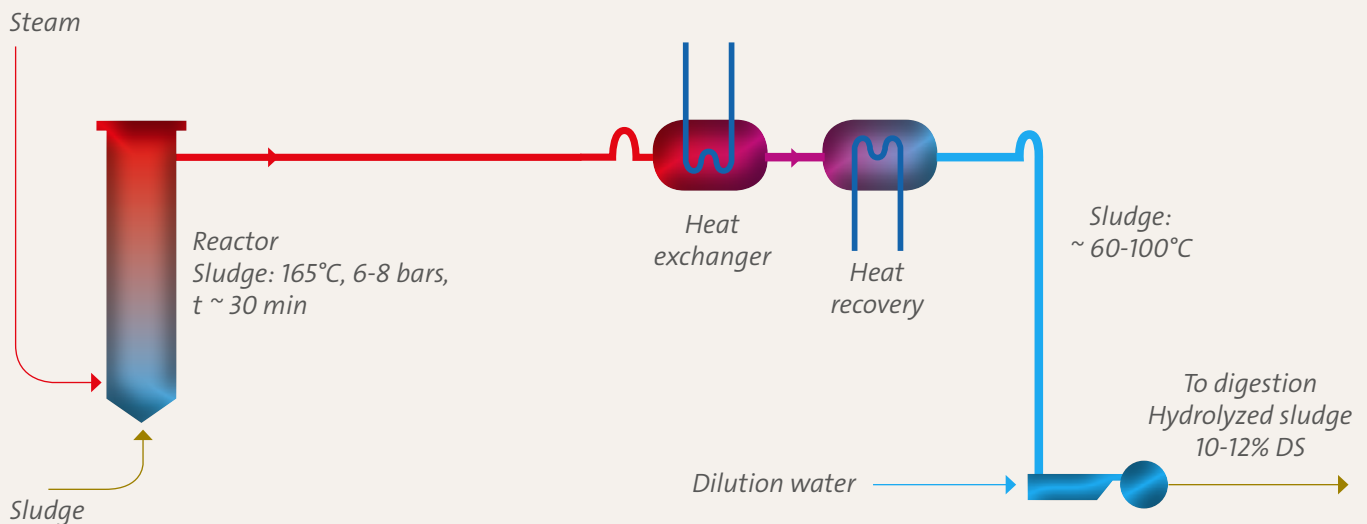


## Exelys

Exelys provide continuous thermal hydrolysis that can operate 24 hours a day with real time adjustable feed rate. Exelys operates under controlled temperature (165°C), pressure (6-8 bars) and residence time (approximately 30 minutes) conditions.

The sludge higher dryness (DS>22%) minimizes steam consumption.

The system is controlled by a PLC that modulates the steam flow rate in line with the amount of sludge injected.



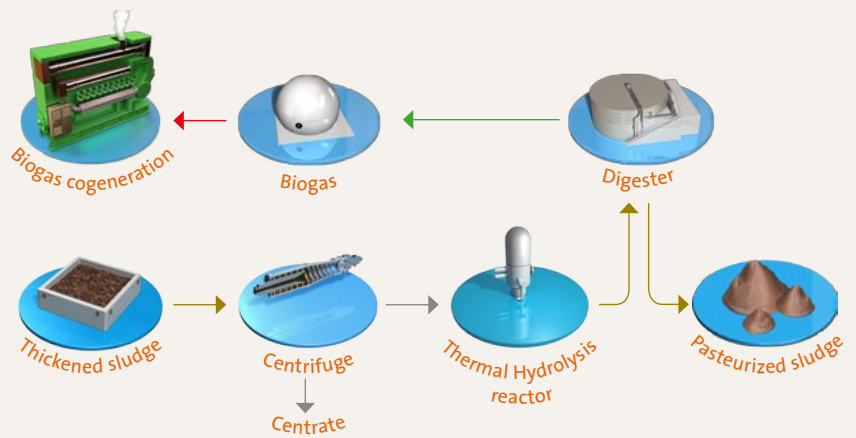
# 3 configurations

## Lysis/Digestion (LD) Configuration

Thermal hydrolysis is performed on the whole or a part of the sludge stream prior to digestion.

This configuration reduces digester volume by a factor of 2 to 3, reduces the amount of sludge and guarantees that it is sanitized while increasing biogas production.

Using the LD configuration, the throughput of an overloaded digestion plant can be doubled, thus avoiding the need to build additional digestion capacity.

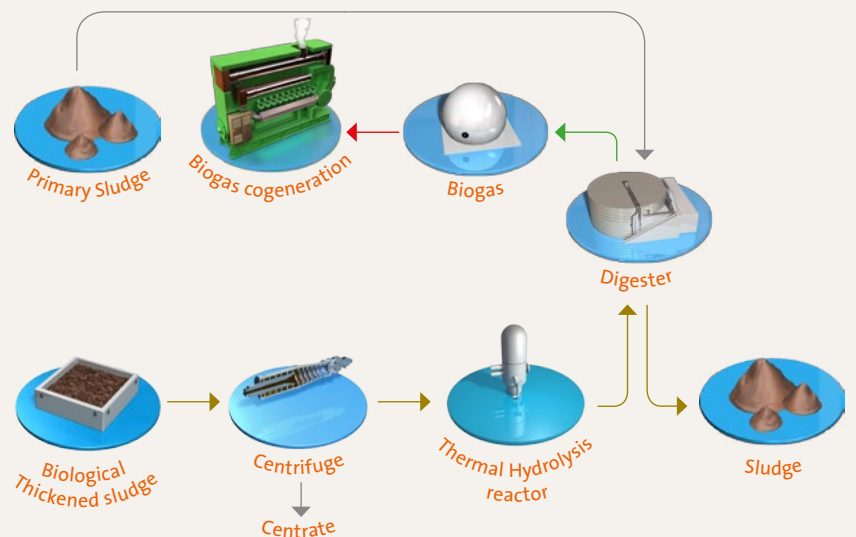


## Partial Lysis / Digestion (Partial LD) Configuration

The Hydrolysis reactor may process only the biological (secondary) sludge with corresponding enhancement on biogas production.

This configuration gives the client the greatest savings in regards to reactor capacity and steam consumption.

Using the partial LD configuration, digestion capacity of an existing installation can be increased by a factor of 2.

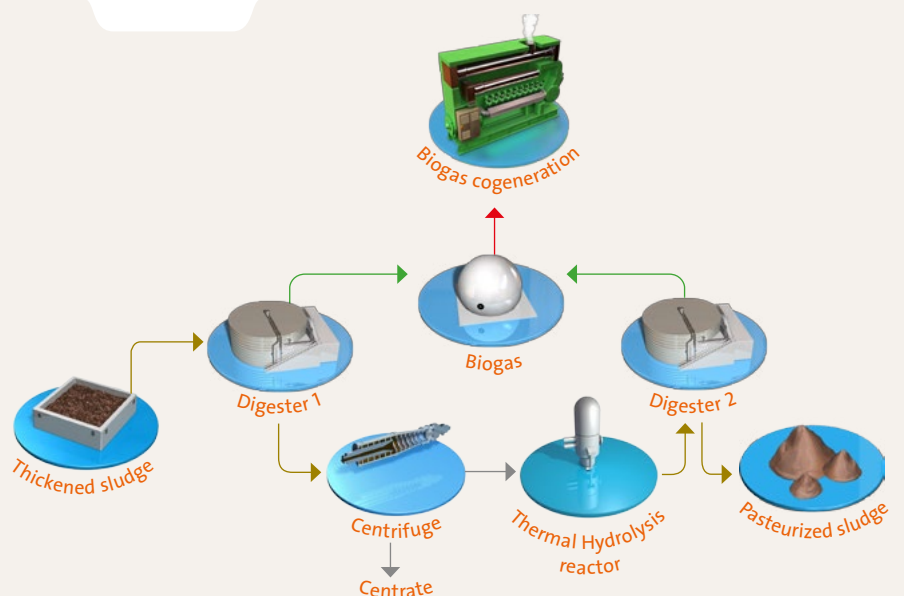


## Digestion/Lysis/Digestion (DLD) Configuration Veolia Patent

Thermal hydrolysis is applied to all of the digested sludge from digester 1. Then the sludge is cooled and diluted before breakdown continues in digester 2.

This is the optimum formula in energy terms as it uses less steam while producing more biogas and electricity.

It also means that the quantity of sludge to be disposed of is reduced.





## A solution that guarantees energy and environmental performance

Many possibilities for using biogas:

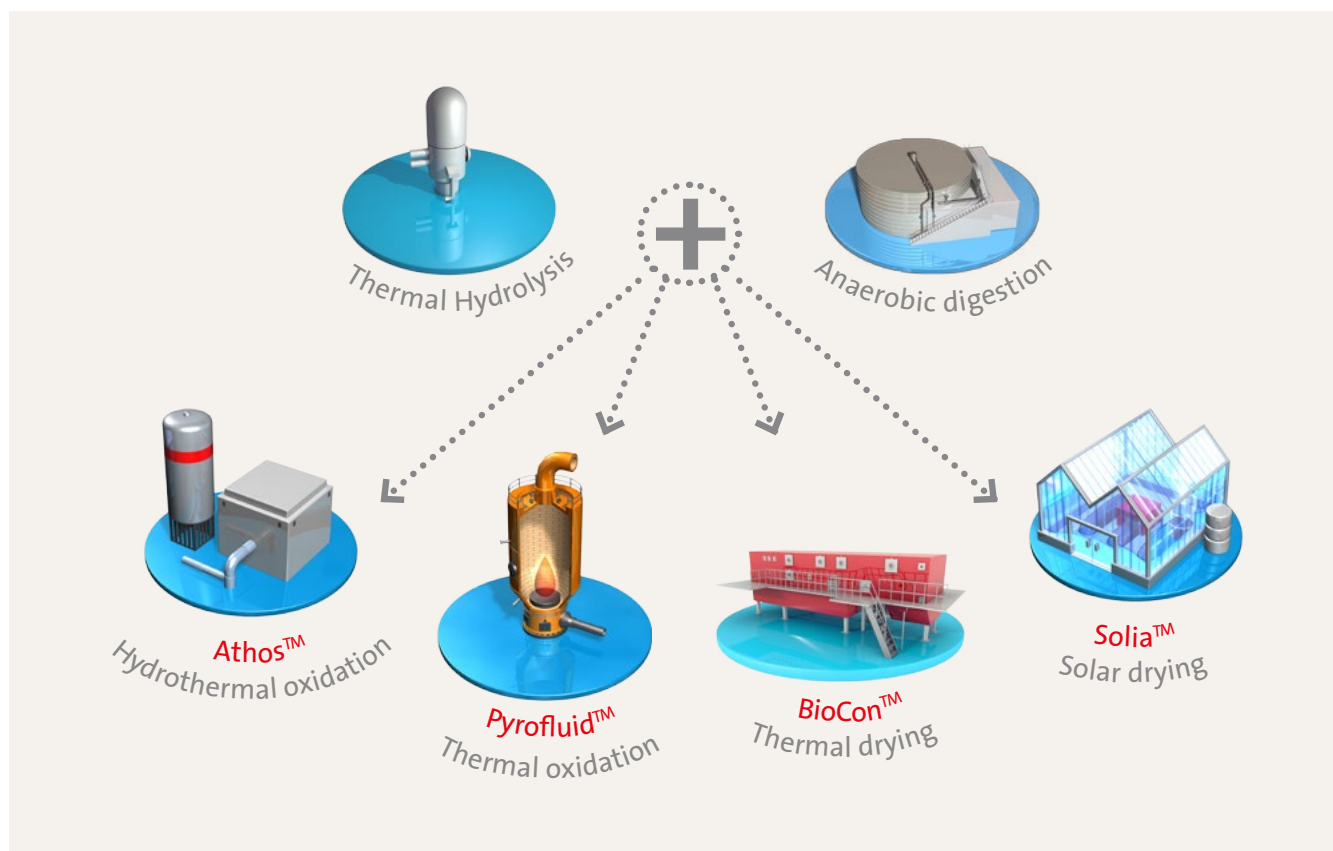
- > Conversion into 'green' electricity via co-generation
- > Biogas cleaning for bio-methane injection, biofuel production, CO<sub>2</sub> and product recovery.

With external input (co-digestion), energy self-sufficiency or even a positive energy footprint may be achieved by the plant.

Thermal Hydrolysis, combined with other Veolia sludge treatment processes, offers even more sustainable solutions.



“*Reduced carbon footprint of the facilities,,*”



“*Complete sludge pasteurization,,*”



## Our Bio Thelys References

2013

### Oxford, United Kingdom

- 1,400,000 PE<sup>(1)</sup>
- 26,000 tDS/year<sup>(2)</sup>
- LD configuration

2013

### Esholt, United Kingdom

- 2,100,000 PE
- 32,800 tDS/year<sup>(2)</sup>
- LD configuration

2011

### Tergnier, France

- 70,000 PE
- 1,600 tDS/year<sup>(2)</sup>
- LD configuration

2010

### Monza, Italy

- 750,000 PE
- 10,200 tDS/year (TH<sup>(4)</sup>)
- 15,800 tDS/year (AD<sup>(3)</sup>)
- LD configuration

2008

### Le Pertuiset SIVO, France

- 80,000 PE
- 2,000 tDS/year
- LD configuration

2007

### Château-Gonthier, France

- 38,000 PE
- 1,000 tDS/year
- LD configuration

2006

### Saumur, France

- 60,000 PE
- 1,600 tDS/year
- LD configuration

<sup>(1)</sup>PE: Population Equivalent adjusted to inlet sludge capacity

<sup>(2)</sup>including imported sludge

<sup>(3)</sup>AD: Anaerobic Digestion capacity

<sup>(4)</sup>TH: Thermal Hydrolysis capacity





## Our Exelys References

<p><b>Ljubljana, Slovenia<sup>(3)</sup></b></p> <ul style="list-style-type: none"> <li>• 550,000 PE<sup>(1)</sup></li> <li>• 19,400 tDS/year (AD<sup>(4)</sup>)</li> <li>• 10,800 tDS/year (TH<sup>(5)</sup>)</li> <li>• DLD Configuration</li> </ul>	<p><b>2017/2018</b></p> <p><b>Yeosu, Korea<sup>(2)</sup></b></p> <ul style="list-style-type: none"> <li>• 140,000 PE</li> <li>• 3,500 tDS/year</li> <li>• LD configuration</li> </ul>	<p><b>2017/2018</b></p> <p><b>GeoJe, Korea<sup>(2)</sup></b></p> <ul style="list-style-type: none"> <li>• 120,000 PE</li> <li>• 3,000 tDS/year</li> <li>• LD configuration</li> </ul>
<p><b>2016</b></p> <p><b>Billund, Denmark</b></p> <ul style="list-style-type: none"> <li>• 130,000 PE</li> <li>• 5,200 tDS/year (AD)</li> <li>• 1,200 tDS/year (TH)</li> <li>• DLD configuration</li> </ul>	<p><b>2016</b></p> <p><b>Versailles, France</b></p> <ul style="list-style-type: none"> <li>• 330,000 PE</li> <li>• 9,300 tDS/year (AD)</li> <li>• 4,000 tDS/year (TH)</li> <li>• DL configuration</li> </ul>	<p><b>2015</b></p> <p><b>Marquette-Lez-Lille, France</b></p> <ul style="list-style-type: none"> <li>• 620,000 PE</li> <li>• 25,000 tDS/year (AD)</li> <li>• 10,000 tDS/year (TH)</li> <li>• DLD configuration</li> </ul>
<p><b>2012</b></p> <p><b>Bonneuil-en-France, France</b></p> <ul style="list-style-type: none"> <li>• Industrial prototype</li> <li>• 300 tDS/year</li> <li>• LD/DL/DLD configuration</li> </ul> <p><i><sup>(1)</sup>PE : Population Equivalent adjusted to inlet sludge capacity</i>  <i><sup>(2)</sup>Preselected supplier</i>  <i><sup>(3)</sup>Awarded</i>  <i><sup>(4)</sup>AD : Anaerobic Digestion capacity</i>  <i><sup>(5)</sup>TH : Thermal Hydrolysis capacity</i></p>		

## Package Exelys

Veolia has developed a standard package Exelys for small to medium thermal hydrolysis plants.

With 4 reactor sizes available, this solution can treat sludge from 8,2 tDS/day to 35,7 tDS/day, for a maximum of 12,000 tDS/year. To minimize site installation and commissioning time, Package Exelys is fabricated and tested offsite, and delivered in pre-erected frames.

Package Exelys also exists with a heat recovery system to reduce and optimize the steam and energy consumption. The heat generated by the hydrolysed sludge is recovered to produce steam and preheat the organic sludge supplied to the reactor.



## Benefits

- Standard Exelys process implementation
- Low steam consumption with the heat recovery system
- Plug & Play solution
- Small footprint

