

# THALE-mail

## USE OF GLASS-LINED APPARATUS THE 10 COMMANDMENTS OF ENERGY EFFICIENCY

**THALETEC** GmbH  
Steinbachstraße 3 | D - 06502 Thale  
Telefon: + 49(0)3947 778-0  
Telefax: + 49(0)3947 778-110  
newsletter@thaletec.com  
www.thaletec.com  
Hotline: + 49(0)3947 778-111



## The 10 Commandments of energy efficiency

*Using energy in a sustainably efficient way - this is a matter of survival for an energy-intensive company such as THALETEC.*

*But you also, as the operator of process engineering plants, certainly keep a constant eye on your energy consumption and look for ways to reduce it.*

*Find out in this paper how products and solutions from THALETEC can help you save energy.*

The high temperatures in the glassing process and the need to repeatedly heat several tons of steel up to 900°C and also cool them again in a controlled way in order to safely burn the chemically highly resistant glass coating with a thickness of up to 2.2 mm require huge amounts of thermal energy, which must be provided by electricity or gas. In order to ensure THALETEC's fitness for the future and sustainable work with the precious "energy raw material", THALETEC has now successfully implemented an Energy Management System in accordance with ISO 50001.

The Energy Management System was successfully audited and certified at the end of November 2013.

Since you too, as a plant operator, are exposed to continuously rising raw material and energy costs and are also constantly looking for opportunities to improve processes and make more efficient use of energy in order to maintain your competitiveness, we considered how we might be able to support you in this connection with our glass-lined product solutions.

We have summarised the results of our considerations in the "10 Commandments for the energy-efficient use of glass-lined apparatus" – see Figure 2. In the table below we have classified THALETEC products and solutions into the individual "Commandments". In parentheses for each product you will see the number of the respective product catalogue or data sheet for the product concerned.

If you read this PDF document on screen, you can, by clicking on the respective catalogue number, download the corresponding detailed product information directly to your computer.

In addition, we have inserted a QR code whereby you can download the respective document using your smartphone and a corresponding App.

Due to the large number of solutions for the individual Commandments, we have broken this paper down into three parts. In this issue you are receiving a summary sheet with the 10 Commandments and THALETEC solutions to Commandments One to Four. In the next THALE-mail issues 54 and 55, the solutions to Commandments Five to Seven and Eight to Ten are dealt with in detail.












Figure 1: Energy Management System ISO 50001 certificate



Figure 2: The 10 Commandments for the energy-efficient use of glass-lined apparatus

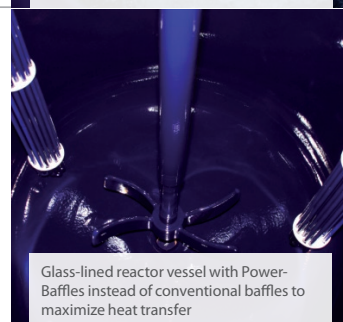
## **10 Commandments for the energy-efficient use of glass-lined apparatus**

- 1. Operate the process at the lowest possible temperature**
- 2. Use process heat again or further**
- 3. Avoid heating or cooling losses**
- 4. Ensure maximum heat transfer**
- 5. Intergrate process steps – avoid material flows**
- 6. Use the best agitation system to meet the agitation operation**
- 7. Use agitator drives with the best efficiency**
- 8. Operate the agitators at the optimum operating point**
- 9. Oversee the device with the best measurement systems and regulate it optimally**
- 10. Ensure easy cleaning, periodical maintenance, inspection and upkeep, and secure a long lifespan; re-glassing is an environmentally responsible and energy-efficient method!**

No.	Commandment	Concept	Possible solutions and measures
1	Operate the process at the lowest possible temperature	The lower the process temperature, the lower the energy demand for heat production, the cost of insulation, etc.	<ul style="list-style-type: none"> <li>Improvement of heat transfer through optimum agitation technology (see illustration right)</li> <li>Reducing heat conduction resistance by optimum choice of material and the glass coating thickness</li> </ul>
2	Use process heat again or further	Use excess process heat or heat from process steps within the plant or even across the entire plant for other purposes, e.g. preheating of media, heating of process water, etc.	<ul style="list-style-type: none"> <li>PowerBaffle (see illustration right)  (K018)</li> <li>EnerEx heat exchanger  (K068)</li> <li>WTU heat exchanger  (K014)</li> <li>SiC heat exchanger  (K014)</li> <li>Further use of waste heat from cooling systems (e.g. cooling fins, lost heat from thermosyphon systems)</li> </ul>
3	Avoid heating or cooling losses	Insulate as appropriate all heated or cooled components and plant components sufficiently for the range of temperature use	<ul style="list-style-type: none"> <li>Stainless steel insulation jacket, tight welded (see illustration right)</li> <li>Insulation of pipes which go warm or cold (product and service media)</li> <li>THALETEC QuickPort quick-opening cover instead of opening the man-hole cover for filling or sampling purposes  (K022)  (MLD)</li> </ul>
4	Ensure maximum heat exchange	Heat transfer is determined by the choice of heating/cooling media and of the agitation system and by the available heat exchange area. Accordingly, give preference to materials with good heat conduction and large exchange areas	<ul style="list-style-type: none"> <li>Select agitation systems not only by the "agitation technology claims" but also from the perspective of optimum heat transfer (see illustration right)  F001</li> <li>PowerBaffles (K018) for increasing the heat exchange area in the interior of the agitation vessel  (K018)</li> <li>Analysis of heat transfer and optimization using a questionnaire  F004</li> <li>Use of more efficient heat exchange areas than only those of the jacket or half-pipe coil</li> <li>Being open to new technologies - not adhering only to the "conventional" and what is well-known in one's own company or field.</li> </ul>



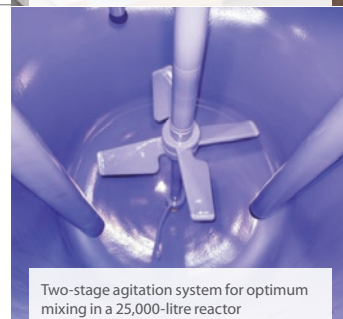
Efficient agitation system in the pass-through operation



Glass-lined reactor vessel with Power-Baffles instead of conventional baffles to maximize heat transfer



Fully-insulated glass-lined reactor vessel also with insulated top head




Two-stage agitation system for optimum mixing in a 25,000-litre reactor











No. Commandment Concept

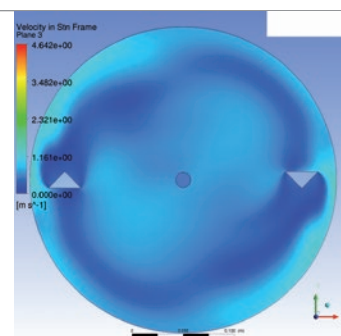
Possible solutions and measures

4

- Regular inspection for fouling in jacket space
- Separate service rooms for heating and cooling media
- Use of "fouling-poor" or fouling-free heating and cooling media
- Use of AgiJet 50 flow nozzle for jacket-side heat transfer output  (K062)  
(see illustration right)
- Use of half-pipe coil at high pressures and with heat transfer media



No.	Commandment	Concept	Possible solutions and measures
5	Integrate process steps - Avoid substance flows	Avoid circulation pumping processes, external recirculation of media, external heat exchangers, external condensers, use gravity for media transport processes, integrating several process steps in one apparatus.	<ul style="list-style-type: none"> <li>Integrate several process steps in the glass-lined apparatus (e.g. gassing, homogenising, suspending or heating up, cooling down respectively)</li> <li>PowerBaffle  (K018)</li> <li>Gassing system SEGTEC with internal recirculation of the process gas  (K054)</li> <li>Make all flange connections leak-free by using premium flange seals (K025, GGN, GMH) from AGR  (K025)  (GGN)  (GMH)</li> </ul>
6	Use the best agitating system to fulfil the mixing task	Depending on the mixing task to be done select the appropriate mixing system, comprising mixing element and baffle system.	<ul style="list-style-type: none"> <li>Analyse the mixing task, simulate and conduct mixing tests in the THALETEC Innovation Centre  (K050)</li> <li>Fast tests and technical mixing optimisation with agitating elements produced by 3D printing  F001</li> <li>Analyse the mixing process using the THALETEC process questionnaire </li> <li>Perform CFD analyses to gain a better understanding of the mixing process and to optimise the mixing result (see Fig.)</li> <li>Conceive and test THALETEC mixing systems on a laboratory scale (LabTec Programme) (see Fig.)</li> <li>Multi-stage agitators for optimum power required with a homogeneous energy distribution in the reactor (K072) with MultiFlex system  (K072)  (K073) (K073)</li> </ul>






CFD simulation of the flow conditions of a DeltaBaffle



THALETEC LabTec mixing system for conducting tests on a laboratory scale

**No. Commandment Concept Possible solutions and measures**

- 6
- Optimum baffle for the mixing task,  (K057)  
e.g. DeltaBaffle with 10 to 15% higher efficiency
  - Optimum agitator to fulfil the primary and other mixing tasks based on THALETEC's comprehensive knowledge
  - Transfer from the tried and tested mixing systems of stainless steel apparatus construction to glass-lined designs

- 7 Use drives with the best possible efficiency
- The mechanical, electrical efficiency of the components used in the drive determines the energy loss of the drive system. The objective is to convert as much as possible of the electrical driving power into agitating performance.
- Motors of higher energy efficiency class IE2 or IE1
  - Spur gear or bevel gears instead of belt drive  (K015) (see Fig.)
  - Contact-free and thereby low friction operating gas-film lubricated mechanical seals instead of contact wet or dry-running mechanical seals
  - Agitating systems for wear-resistant mixing: THALETEC AMT agitators  (K055)

