



SyntHEX – The innovative simulation tool for smart heat exchanger networks

Using SyntHEX to increase energy efficiency, reduce costs, stabilize processes, and protect the climate



XRG Simulation GmbH

XRG stands for high performance in the simulation of energy systems

We combine innovative thinking and continually expanding expertise to create successful technologies and strategies

With highly qualified teams of engineers, mathematicians, and physicists, XRG Simulation carries out complex system simulations throughout Germany using numerical methods and a networked approach. We specialize in energy technology and help industrial and commercial enterprises and research institutes to analyze, develop, and optimize projects and products.

We offer simulation, programming, consulting, and support as a one-stop provider

We work with state-of-the-art simulation tools and we program tools that can be adapted to specific requirements and systems – in buildings, aviation, and shipping, in process and plant engineering, and in the automotive industry.

We provide our customers with expert advice and full support regarding simulation tools, applications, and decisions on costs and technical specifications.

We are continually expanding our horizons with complex scientific projects

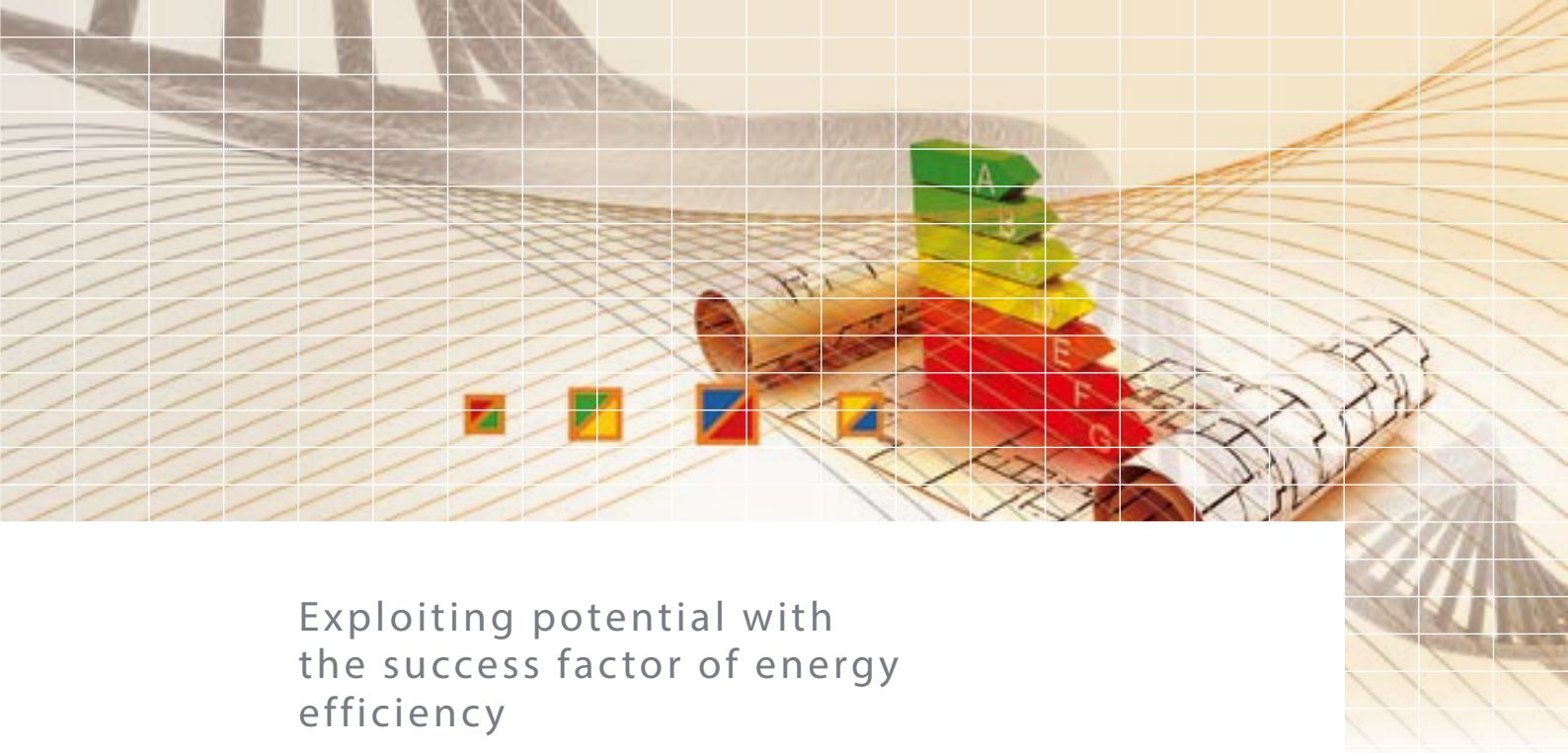
XRG Simulation has made a name for itself in the simulation and modeling of energy systems. The company participates on an ongoing basis in complex energy technology research projects, cooperating with well-known research institutes and companies.

The SynthEX simulation software application is a sophisticated product that we have developed together with the Institute for Process and Plant Engineering at Hamburg University of Technology – a perfect example of successful collaboration between industry and a research body.

SUPPORTED BY:



Federal Ministry
of Economics
and Technology



Exploiting potential with the success factor of energy efficiency

XRG advises you in the simulation of energy efficiency measures

The generation of process heat accounts for more than 50 % of German industry's total energy demand. This therefore represents a significant cost factor for many companies and a starting point for developing efficiency measures with multiple advantages. Increased energy efficiency helps reduce both CO₂ emissions and production costs, and makes your company more competitive.

We help industrial and commercial enterprises and research institutes to systematically exploit their efficiency potential.

Our services are tailored completely to your requirements

We carry out calculations for energy systems according to your requirements. We can also advise you on modeling and simulation procedures you wish to carry out yourself. We can work either together with you or alone to find the best possible solutions to minimize your energy consumption



and costs.

Our teams and tools can tackle highly complex assignments

We work with state-of-the-art simulation tools, adapted to your particular needs as you require. Together with the Institute for Process and Plant Engineering at Hamburg University of Technology, we have developed the SyntHEX simulation software application (see page 4) specially for determining the optimal heat exchanger networks to use. We get impressive results with this new and relatively inexpensive tool, with much greater savings in cost than was previously possible.



More about the
services XRG provides



XRG Simulation GmbH

SyntHEX can ensure your company remains competitive

The new simulation software generates the best possible solutions for increasing energy efficiency in process and plant engineering

Why SyntHEX is the most effective way of determining the optimal heat integration method

SyntHEX is a new simulation tool for reliably finding the most efficient measures for reducing energy demand – through smart heat recovery in industrial processes. The software provides highly optimized solutions due to genetic algorithms. These algorithms use selection criteria to evolve candidate solutions towards the best solution only. What is special about SyntHEX is that the program only allows solutions that ensure stable process control, and it allows for

variable economic parameters. Generation of the heat recovery solutions is completely automatic.

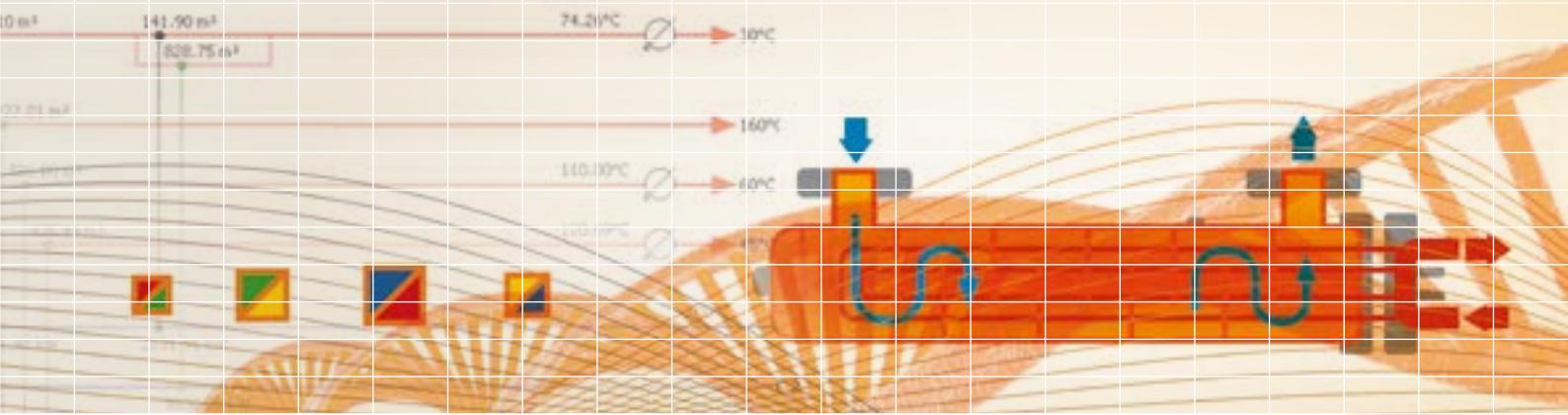


The new SyntHEX software application developed by XRG in collaboration with Hamburg University of Technology helps you to exploit your energy efficiency potential to the full.

SyntHEX is so effective that you can reduce your investment and operating costs by up to 25 % compared to conventional methods

Configuration	Heat exchanger		Sub-networks		Total cost (\$ p.a.)			Saving
	PM	SY	PM	SY	Without WR	PM	SY	
H9C6	17	12	0	3	3,119,000	599,000	513,000	14 %
H10C10	20	12	2	8	3,369,000	2,063,000	1,723,000	17 %
H22C17	73	22	2	17	5,562,000	2,262,000	1,921,000	15 %
H26C29	58	32	6	23	16,387,000	8,839,000	6,662,000	25 %

In a test comparing SyntHEX (SY) with the traditional pinch analysis method (PM) with reference to specific examples, the findings show clearly that SyntHEX (SY) comes up with more cost-efficient solutions for heat exchanger networks. One particularly distinct feature of these networks is that they work with a large number of sub-networks. The number of heat exchangers is also much smaller than with the pinch analysis method. This not only saves on costs but also means better control of processes in practice.



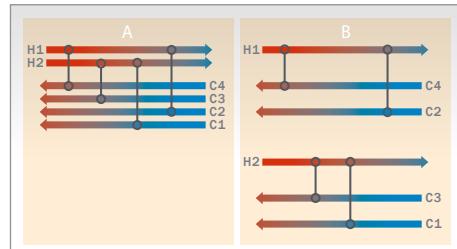
With SyntHEX, you can generate optimal heat integration solutions for both existing and new systems

SyntHEX combines flows ingeniously so you can achieve greater efficiency and more stable processes

The solutions the program searches for combine hot and cold product flows to bring down heat demand and waste heat to a minimum. This is achieved using smart heat exchanger networks between the cold and hot flows. However, the use of heat exchangers increases investment costs. For this reason, SyntHEX favors solutions that require as few heat exchangers as possible to achieve optimal thermal balance. Moreover, the program takes practical aspects of process control into account. SyntHEX therefore favors solutions with sub-networks that help prevent any errors from spreading to the entire system.

Clever integration of sub-networks means greater process control

Sub-networks are thermally independent of one another, meaning that possible errors remain restricted to the specific sub-network. Heat exchanger networks with many sub-networks offer key advantages: they need fewer heat exchangers, they are less complex and thus also less susceptible to error, and users have greater process control.



The figure above shows the subdivision of a heat exchanger network into two equal sub-networks.

The advantages of SyntHEX at a glance

- > Planning and optimizing process heat flows with SyntHEX minimizes investment and energy costs
- > SyntHEX provides optimal solutions with sub-networks that can be easily integrated into existing processes without increasing susceptibility to error
- > SyntHEX is suitable for optimizing both existing and new systems
- > By increasing energy efficiency, SyntHEX helps protect the climate

More about SyntHEX
and other XRG products





XRG Simulation GmbH



SyntHEX brings together scientific and practical expertise in one product

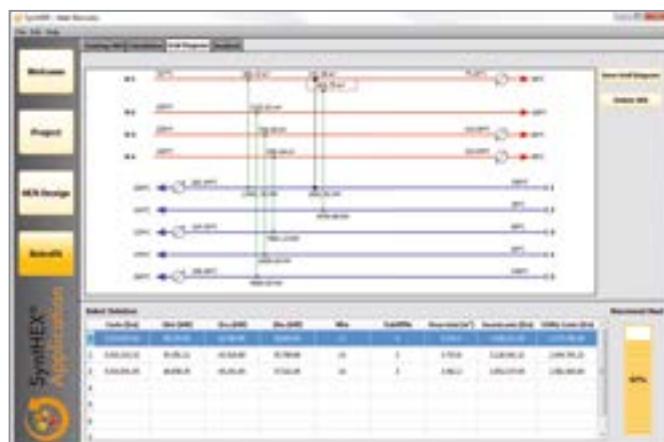
This is demonstrated by our findings from practical application

Elements of the SyntHEX algorithms

- > Economic parameters such as annual investment costs (heat exchangers) and operating costs (energy demand)
- > Different calculation methods for individual heat exchangers. This means that special requirements of the equipment for individual process flows can be taken into account
- > Process flexibility
- > Safety aspects relating to both product flows in the heat exchanger
- > Production processes are considered in their entirety. One advantage of this is that greater susceptibility to error due to excessive process integration is avoided

Parameters that take into account the particular features of the specific project

- > Desired inlet and outlet temperature for all product flows
- > U-values for each heat exchanger
- > Heat capacity flows
- > Investment costs for heat exchangers (incl., for example, government grants)
- > Consumption costs for heat exchangers (incl., for example, CO₂ certificates)
- > Heat exchanger costs relating to:
 - > Type of heat exchanger
 - > Costs of material used



User interface of the SynthEX simulation software application

Available for the following operating systems:

- > Windows
- > Linux
- > Mac OSX



Training: Understanding and using SynthEX successfully

We can provide you with training in creating heat recovery solutions, even for very complex processes

We will pass on our expertise to you

We provide a two-day training program where you can get to know all the key features of SynthEX. You will benefit from our many years of experience in designing heat recovery solutions for the process industries. Moreover, our training course leader, Christopher Brandt, played a key role in developing SynthEX. Course participants will be introduced to methods for the energetic analysis of processes and, by the end of the course, will be able to create the optimal heat integration solution, even for very complex processes.

Course content

Energetic analysis of process engineering processes

- > Manual design of simple HEN
- > Simple optimization methods
- > Implementation of heat pumps/vapor compressors
- > Particular challenges relating to complex processes
- > HEN synthesis with SynthEX
- > Analysis and measurement of heat recovery solutions
- > Optimization of existing systems using SynthEX (retrofitting)



Target group: The course is aimed at technical specialists, engineers, and scientists working in the fields of process engineering, analysis, and development.

Requirements: A basic understanding of process engineering processes would be helpful. The course is, however, also accessible to those with general scientific knowledge.

Interested?

Then please contact us:

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More about XRG
training





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Technische Universität Hamburg-Harburg



Institut für
Prozess- und Anlagentechnik