

# Opportunities using the energy system optimization tool reMIND



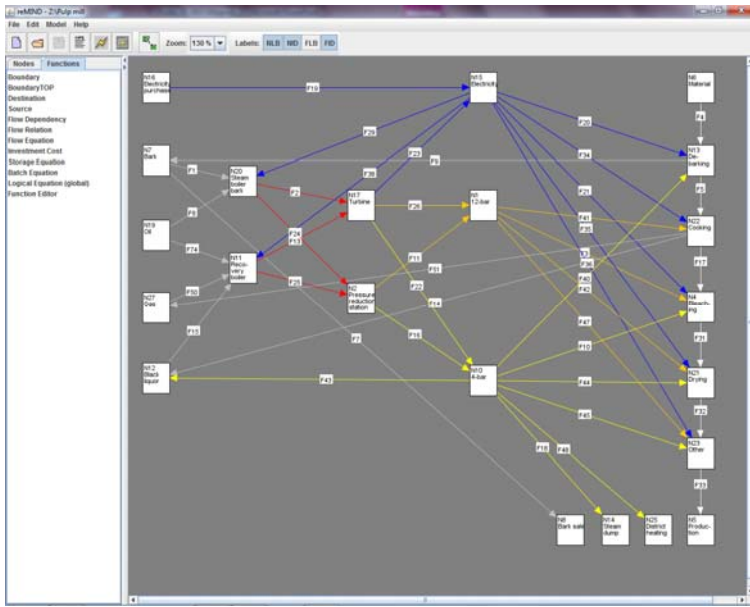
Linköping University  
expanding reality

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## History

The development of a method, called MIND (Method for analyzes of INDUSTRIAL energy systems) started in the early 90ies at the division Energy Systems at Linköping University, Sweden. The software reMIND,

based on the MIND method, includes a graphical user interface along with a number of functions in order to analyze industrial energy systems.



## Development environment

reMIND is designed at a development environment where it is possible to download the program, post issues and find a publication list.

### Example:

In the steel industry reMIND has been used to e.g. analyze material and energy balances during renovation of a coke oven battery, when changing the system boundary, showing large interaction effects between the different production units within the plant.

Webpage: <http://code.google.com/p/tremind/>



### Example:

The concept industrial symbiosis has been evaluated using reMIND, including a pulp mill, a sawmill and a biofuel upgrade plant in symbiosis with a district heating system, showing large potentials to reduce costs, amount of excess heat and steam discharge at the same time as bark sales are possible to increase.

## Companies

reMIND has been used in numerous companies from several industries. Below is only a sample of these:

- SKF
- VOLVO
- Arla Foods
- Astra Zeneca
- SSAB
- Sandvik
- Scania
- Stora Enso

## Publications

In total there are more than 100 publications, in whole or in part, based on modeling using reMIND, e.g.:

- dissertations
- scientific articles
- reports
- theses

A list of publications may be found in the development environment, described below.

## How does reMIND work?

The program is developed as a general tool to be able to model a variety of industries and their energy supply and use. However, it is possible to model any kind of system, but so far only energy-related problems have been modeled both in industries and district heating systems and in the integration in between. With the help of optimization routines the system cost is minimized based on the limitations and conditions the modeled company is exposed to. However,



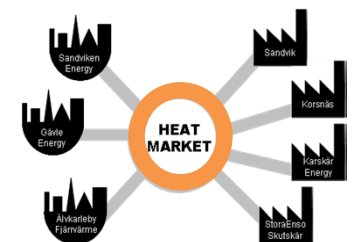
### Example:

In a foundry, using reMIND, it was concluded that the holding furnaces would in the future be valuable to reduce electricity costs. The head of the company had decided to remove the holding furnaces when investing in new furnaces, but due to the reMIND study, the decision was changed.

any type of minimization may be accomplished when using reMIND, e.g. minimizing CO<sub>2</sub>-emissions. It is also possible to model problems with multi-objective characters. The structure of the problem is represented by branches (e.g. electricity) and nodes (e.g. process lines). Each node includes numerous functions describing the functionality of the node. Time is divided into time steps to consider the dynamics of the system.

### Example:

Great savings has been shown when introducing a heat market in a region north of Stockholm, where several industrial and energy companies could sell and buy heat.



## Users

So far, reMIND has mainly been used in the academia (but also at Swerea MEFOS):

- Linköping University,
- Luleå University of Technology,
- University of Gävle
- Chalmers University of Technology

## Contact

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Information regarding reMIND may be found at the webpage:  
<http://code.google.com/p/tremind/>

