CHEMCAD Process Simulation for Equipment Manufacturers

Chemstations and Nor-Par

Chemstations Inc based in Houston TX, USA are the owners and makers of the CHEMCAD Suite of process simulation software.

Oslo-based Nor-Par a.s is exclusive distributor of CHEMCAD Suite in Scandinavia, East Europe and Russia. Nor-Par a.s and its daughter company Nor-Par Online A/S also provide own software and solutions to fill the gap between standard process simulation software and unique needs of the market as well as unique needs from a specific client.

Do *you* need CHEMCAD?

Your company is an equipment manufacturer. As long as your equipment processes fluids and solids, you need this information for proper design or selection of the right equipment:

- Physical properties of pure components or mixtures taking part in the process
- Thermal state of media taking part in the process
- Different property charts
- Detailed mass and heat balance around your equipment
- Optimum operating parameters for your equipment
- Knowledge on how other equipment taking part in your process will affect the performance of your equipment
- Feasibility of your equipment performance in given process: Will your equipment perform or should you find some alternative solution that you could sell as well?
- Operating limits of your equipment
- Control parameters to make the operation of your equipment manageable in the plant
- Safety aspects of the performance of your equipment
- Technical data sheets
- Environmental considerations
- Possibility to transfer the data to other programs for mechanical design of your equipment
- Equipment costing

If you believe that you need any of the functionality as described above, you should take your interest in CHEMCAD and complementing modules CC-THERM and CC-DYNAMICS to the benefit of your company. We may serve you with mechanical design software, too.

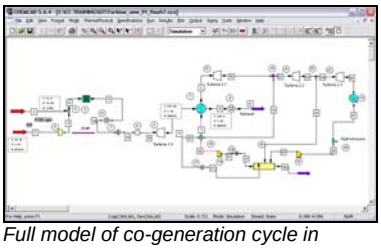
Why CHEMCAD?

The CHEMCAD Suite of process simulation software, present in the market since 1984 is nowadays one of the most modern and easy to use programs, serving oil & gas, oil refining, petrochemicals, organic chemicals, inorganic chemicals, power, pulp & paper as well as specialty chemicals markets, even extending to cosmetic, alcohol, brewing and food industries.

The range of equipment served is very broad:

- Packed and tray distillation and absorption columns
- Batch distillation columns
- Separators
- Compressors
- Turbines
- Pumps
- Heat exchangers: shell & tube, plate & frame, double pipe, air coolers, square finned-tube coolers
- Combustion equipment
- Pressure vessels
- Storage vessels
- Fired heaters
- Boilers
- Vessel reactors
- Tubular reactors
- Ejectors
- Extractors
- Adsorbers
- Membrane separators
- Solid handling equipment such as
    - Filters of different type
    - Centrifuges
    - Cyclones
    - Hydrocyclones
    - Crystallizers
    - Dryers
    - Sieves
    - Electro-filters
    - Crushers/grinders
    - Solid washers
- Piping including transportation pipelines
- Control valves
- Orifices
- Industrial controllers
- Pressure Relief Valves and Rupture Disks

The features related to thermal design of heat exchangers require the additional integrated module of CC-THERM. If you work with any batch, semi-batch or unsteady process (such as storage or intermediate tanks, heating or cooling in vessels), you may benefit from additional integrated module CC-DYNAMICS.



Full model of co-generation cycle in CHEMCAD (gas turbine/steam turbine)

Openness

CHEMCAD and the completely integrated modules CC-THERM, CC-DYNAMICS, CC-BATCH, CC-SAFETY-NET and CC-POLYMER form together powerful Windows program, open to the world of the manufacturing and engineering with its interfaces via CAPE-OPEN, OLE, OPC, API (VB/C++) and Excel as well as interfaces to **mechanical heat exchanger software** or life-cycle project management tools such as COMOS and AXSYS.

Easy to use

CHEMCAD, CC-THERM and CC-DYNAMICS are the easiest to use process calculation programs found in the market. You are able to solve your first design or optimization problem in minutes: Draw a sketch (flowsheet), select components, let the program help you selecting the right thermodynamic methods, enter your feed streams, define the equipment specifications, calculate, analyze the results and make reports and Process Flow Diagrams.

Value for money

Unlike other process simulation programs, CHEMCAD, CC-THERM and CC-DYNAMICS have a big number of valuable features included as a standard and you do not need to pay any extra for it. For example, there is crude oil database, electrolytes, amine sweetening, glycol dehydration, hydrate prediction, pressure relief device calculation (DIERS), mass transfer in distillation, environmental analysis (WAR), solid handling, advanced pipeline simulation, piping network analysis as well as hundreds of other expensive features that you get included in the license.

The software is available in several licensing forms from unlimited network license to limited license where you only pay for what you really use.

Physical property calculations

All modules of CHEMCAD, that is, CHEMCAD-STEADY STATE, CC-THERM, CC-DYNAMICS and the included as an extra CC-SAFETY NET include as common features:

- The **DIPPR databank** with **complete** physical property data of over 2000 components
- **You can add your own components** including **solid fuels**. The tool to determine the properties of solid fuels based on elemental analysis is available.
- **Crude oil database** with 250 brands of oils included as standard
- **Solid components** available as standard feature
- **Electrolyte package** as standard feature
- Full thermodynamics/physical calculation of **60 mixture properties**
- **Equilibrium databank** of DECHEMA as standard feature
- **Steam table** as standard feature
- Desulphurization by **amine absorption** (amine model, electrolytes) or by **adsorption**, also by the latest technologies (e.g. chelates)
- **Dehydration** by glycols
- Prediction and inhibiting of **hydrate formation**

Determining the thermal state of process streams

For any process stream, any module of the CHEMCAD Suite **automatically calculates its thermal state and all physical properties**. You can determine the vapor or liquid fraction in a two-phase stream, calculate the bubble point or dew point.

Producing property charts

Variety of charts is available as standard feature:

- **Phase envelopes**
- **TPXY** and **Distillation Curves** charts
- **Binodal Plot** (for extraction)
- **Residue Curve Map**
- **Heat Curves**
- **Composite Heat Curves**
- **Stream Property** charts
- **Pipe Profiles**
- **Tower Profiles**
- **Plug Reactor Profile**
- **Column, vessel, stream and equipment histories for Dynamics**

All the charts have **automatic export to Microsoft Excel**.

Detailed heat and mass balance

CHEMCAD and CC-DYNAMICS allow you making detailed and accurate heat and mass balance for your equipment or process. CC-THERM does detailed mass and heat balance not only around the heat exchanger but also internally, by **zone analysis**.

Your equipment can be entangled inside multiple level **recycle loops** that are solved automatically. Full **pressure profile** around your system is calculated.

For **dynamic simulation**, CC-DYNAMICS provides stable and powerful solver allowing extremely quick finding the solution of an unsteady problem. The transition **from steady state to dynamic simulation** is seamless and easy.

Optimum operating parameters for your equipment

CHEMCAD has **Sensitivity Analysis** and **Optimizer** as standard features, allowing you to find optimum operating parameter set for your equipment in minutes.

Interaction with other equipment

Your equipment piece is not alone in the process unit or a plant. Check how equipment surrounding your own unit will affect the performance of your delivery. Sometimes you could avoid expensive guarantee penalties knowing beforehand what could happen to your equipment in **true operating environment**.

Feasibility studies

The request from the customer for specific equipment might not be feasible. Check I you really could make and deliver operable equipment or find alternative way of serving the client with a **better solution**.

Operating limits

Find out the operating limits of your equipment and see if it would really work under specifications from the customer.

Controlling your equipment

Together with your automation personnel, check in CC-DYNAMICS how controllable your equipment will be in the proposed producing scheme. CC-DYNAMICS can simulate the performance of **Control Systems** together with the process equipment.

Process safety

The policy of your company is to deliver safe solutions. Do **safety studies** in CC-DYNAMICS. Check the consequences of break-down of your and the surrounding equipment. Select **pressure relief devices** properly (CHEMCAD and CC-DYNAMICS have the DIERS Technology for safety devices available as standard feature). Design interlocks and other control safety features. Use our **Training Simulator** running on a detailed dynamic model to help the operators be trained properly.

Technical data sheets

CHEMCAD produces **data sheets** in Excel format for each equipment piece that you work on. The data sheets can be made in your own language and in format of your company. CC-THERM provides full set of data sheets for heat exchangers including TEMA sheet.

Environmental issues

CHEMCAD and CC-DYNAMICS calculate the amount and composition of waste products. The WAR technology from Environmental Protection Agency of the United States is available in the program as standard for reporting of environmental impacts of the waste from the plant.

Data transfer

CHEMCAD, CC-THERM and CC-DYNAMICS are completely open software, capable to “talk” with other software via CAPE-OPEN, OLE, OPC, Excel. CC-THERM has special interface to **MT-EXCH** and **MT-LAYOUT**, which are premium mechanical design programs, also available from Nor-Par. CHEMCAD has own interface with **SULPAK**, the Sulzer’s packing selection program for distillation and absorption columns.

Equipment costing

CHEMCAD has the **Equipment Costing** feature available as standard. Investment costs are calculated by the Chemical Engineering methodology and are open, so you can put in your own costing algorithms. **Manufacturing Cost** calculations are also available in the program.

Distillation and absorption: tray and packed columns

CHEMCAD and CC-DYNAMICS allows rigorous calculation of any type of distillation, stripping or absorption processes in tray or packed columns. **Mass transfer model** is available as standard feature for the most precise calculation of such processes. There is no problem with extractive, azeotropic or reactive distillation/absorption. Systems with electrolytes are calculated easily.

CHEMCAD has **tray** and **packing sizing** and **column hydraulics** calculation. Libraries of **industrial packings** are available as standard feature.

Batch and **semi-batch** columns are calculated in CC-DYNAMICS, or with extra module **CC-BATCH**.

Separators, pressure vessels, storage vessels

CHEMCAD/CC-DYNAMICS can simulate any type of vessel for process conditions. **Pressure vessel design** tool is available.

Pressure vessels and atmospheric tanks can be simulated for safety with **Pressure Relief Valves** and **Rupture Disks** according to API 520/521, API 2000, OSHA 1910 106, NFPA-30 for operating and fire conditions.

Any type of tank requiring **heating or cooling** with jackets or coils can be rigorously calculated in CC-DYNAMICS. **Libraries of Pfaulder reactors** are standard in the program. You can add your own reactor types.

Compressors, turbines, pumps, ejectors

CHEMCAD/CC-DYNAMICS include rigorous models of performance for **compressors**, **turbines** and **pumps**. You can enter your own performance curves and calculate the action of your equipment in real operating environment. This helps selecting the right model of your equipment for the customer's expectations.

Ejectors can be easily simulated.

Heat exchangers

CC-THERM allows design, rating and fouling rating of shell & tube, plate & frame, double pipe, air cooled and square finned-tube heat exchangers. All process data come transparently from CHEMCAD or CC-DYNAMICS simulation. The calculation in CC-THERM gives you **full thermal design** or **rating** information, according to TEMA, ASME, DIN, B.S. or custom standard. Vibration analysis is available. Construction material databank is available as standard.

The major feature is **true heat exchanger simulation** in CHEMCAD/CC-DYNAMICS based on the exchanger's geometry. The calculations are done internally in CC-THERM. So you do not need to assume how give heat exchanger would work. **You will know how you heat exchanger will really work** under given process conditions.

Combustion

CHEMCAD has all the features needed to simulate combustion processes. You can burn gaseous, liquid, solid and mixed phase fuels. The program will calculate the demand for oxygen, air or any other combustion agent. You can use the combustion gases for further heat recovery in other equipment units, such as steam generator, boiler or recuperator. Auto-therm combustion is very easy to model, which is important in effluent combustion. Thermal cycles are very easy to model as well.

Fired heaters, boilers

CHEMCAD/CC-DYNAMICS/CC-THERM have all necessary tools to rigorously model **fired heaters**, including the convection and radiation zones, utility and process sides.

Boiler design is very easy and you can build entire thermal cycles.

Reactors

CC-DYNAMICS has all necessary tools for design of **vessel reactors**. **Libray** of **Pfaulder reactors** is available as a standard in CC-DYNAMICS. **You can add your own reactors to the library**, test their performance and give the client the right solution and advice.

Tubular reactors can be simulated in CHEMCAD. There is no problem to calculate processes occurring in long tubes or coils of tubular reactors, and detailed and accurate solution is obtained.

Extractors

CHEMCAD has the Extractor model for **liquid/liquid extraction** process.

Solid/liquid leaching is possible to calculate with the Crystallizer model or using Electrolytes.

Adsorption, membrane separation

Adsorption modeling is possible in CC-DYNAMICS.

Membrane Technology unit to run under the control of CHEMCAD has been made by Nor-Par and is available to CHEMCAD clients at separate price.

Solid-fluid separation, crystallization and solids handling

CHEMCAD has 13 different types of unit operations for solid-fluid separation, crystallization/dissolution as well as for solids handling. You can also do crystallization of inorganic material using the Electrolytes.

Piping and pipelines

CHEMCAD and CC-DYNAMICS have the advanced PIPE model:

- Single, **two-phase** and **slurry** (solid-liquid) flow
- Detailed heat transfer model with the environment (air, water, soil, user-defined medium) and multiple insulation layers
- Simulation of **extremely long** pipelines
- **Property profiles** over the pipeline length
- Simulation of **pipeline networks**
- Possibility of simulating any type of piping, including **flaring systems**
- Piping and pipelines can have any number of different **fittings**, the library exists as a standard feature
- **Critical** and **subsonic flow**, **Joule-Thompson effect**, **choked flow**.

Control Valves and Orifices

CHEMCAD and CC-DYNAMICS include facilities to calculate **Control Valves** and **Instrument Orifices**.

Industrial controllers

CC-DYNAMICS includes standard PID controller model. Nor-Par can write for the clients a model of any **industrial controller** according to specified algorithm and to be run under the control of CC-DYNAMICS.

Pressure Relief devices

Performance of **Pressure Relief Valves** and **Rupture Disks** according to API 520/521, API 2000, OSHA 1910 106, NFPA-30 for operating and fire conditions can be calculated both in steady state and dynamics. **DIERS** (Design Institute for Emergency Relief Systems) technology is built in CHEMCAD and CC-DYNAMICS.

More questions?

- Please first refer to brochures for CHEMCAD, CC-SAFETY NET (this program is included in CHEMCAD), CC-THERM, CC-DYNAMICS, CC-BATCH and CC-POLYMER.
- Ask your dedicated representative of Nor-Par for organizing a Web demo (a presentation over Internet) to answer more detailed questions.

The exclusive distributor in Scandinavia, The Russian Federation and East Europe

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