WETCOOLING SOFTWARE

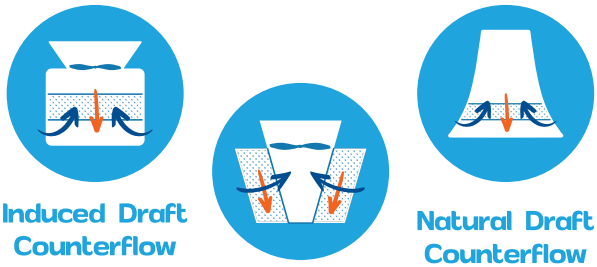
THERMAL PERFORMANCE EVALUATION & DESIGN SOFTWARE FOR WET-COOLING TOWERS

TYPES OF TOWERS

Types of wet-cooling towers that can be analyzed:

- Induced draft counterflow
- Induced draft crossflow
- Natural draft counterflow

The software includes the generally accepted ***Merkel*** model, the ***e-NTU*** model and the rigorous ***Poppe*** method that can accurately calculate the state of the outlet air.



Induced Draft Counterflow

Induced Draft Crossflow

Natural Draft Counterflow

SOFTWARE BACKGROUND

The competitive advantage of the software is that it is completely independent and not tied to any cooling tower or fill manufacturer.

The software is based on the two volume book by Prof D.G. Kröger, **Air-Cooled Heat Exchangers and Cooling Towers:** Thermal-Flow Performance, Evaluation and Design, *PennWell Corp., Tulsa, Oklahoma, USA, 2004.*

The book serves as a ***technical manual*** for the software. The software is therefore not a "black box" as all models and theories employed are referenced and demonstrated in detail. In addition to the book, the software is also based on extensive research (by the developer), that has been published in leading academic journals.

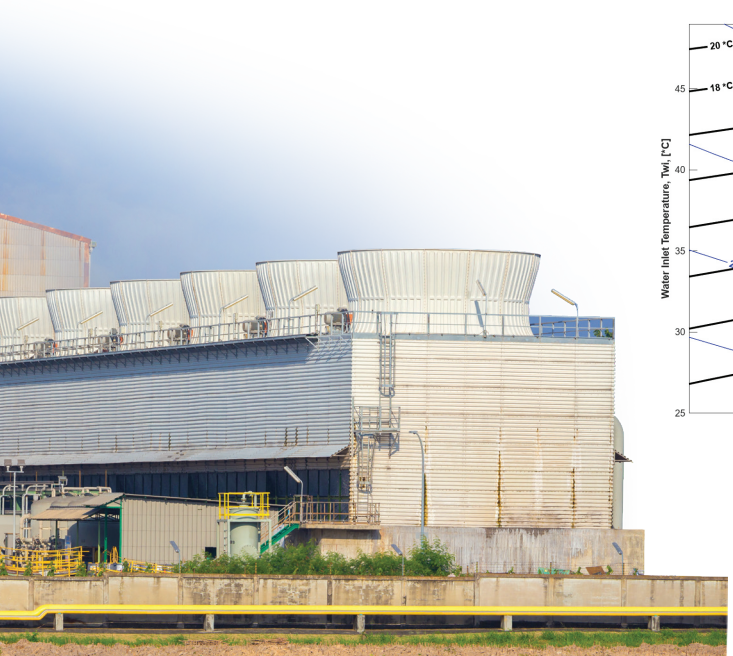
SOFTWARE SOLUTION MODES

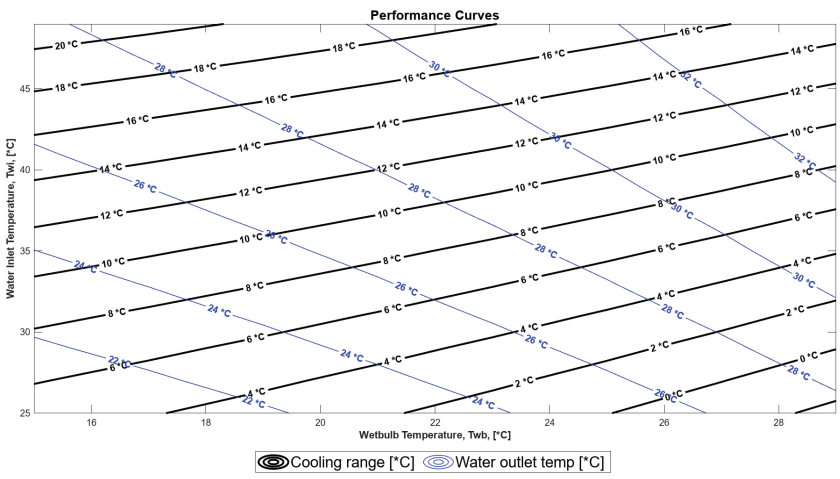
The software has three general solution modes:

- **VERIFICATION MODE:**
  Cooling tower designs can be verified in this mode. This mode can also be used to investigate the impact of dimensional and operational changes on the performance of existing cooling towers. Cooling towers can be manually designed in verification mode.

- **PERFORMANCE CURVES MODE:**
  This mode can be used to generate performance curves for a cooling tower where the water outlet temperature, tower duty, water evaporation rate and cooling range are plotted against the water inlet temperature and atmospheric wetbulb temperature.

- **DESIGN MODE:**
  The dimensions for a cooling tower are calculated to meet a specified cooling duty. Many feasible designs are calculated.





Example of a performance curve

SPECIAL FEATURES

- Various fills are included in the software. This database can be expanded by client request and fill manufacturer consent. Contact us for a quotation.
- Two different fills can be used in the tower, as some manufacturers, for example, prefer to use a splash fill on top of a film fill.
- The effects of the rain zone and spray zone are included in both the pressure drop and energy transfer calculations. The user can also specify the effects of the various cooling tower components on the operation.
- The software can be used with, or without the specification of a fan.
- A database of fans can be built up by the user. There is a module to help with the fan curve fitting procedure.
- Online demo videos are available to show how to use the software.
- The software runs input checks and warn the user of possible input mistakes.
- The user has full control over all input parameters.
- The software can be used as a research tool to investigate the effects on performance of:
  - Different operating and atmospheric conditions
  - Different fills
  - Different fan speeds
  - Different dimensions
- The software uses the metric system but there is a conversion tool to help with the conversion of some imperial units.
- A tool is included to calculate Merkel numbers for crossflow and counterflow fills. Very basic cooling tower dimensions can be calculated with a specified fill and known Merkel number.
- The software has detailed output tables and graphs, showing the cooling range, fan performance, fill performance, pressure drop and energy transfer contribution of the various components. Some tables can be exported to Excel.

The software is ideally suited to answer all those "what-if" questions asked by engineers about cooling towers.

Some of the questions the software can answer are:

- What effect has changing ambient conditions (temperature and humidity) on cooling tower performance?
- The software can help to generate missing or outdated cooling tower performance curves.
- What will the effect on tower performance be if the fill is removed?
- What can be done to increase cooling tower performance?
- Will the cooling tower be able to handle an increased cooling load?
- What will happen if the water flow rate is increased?
- What modifications can be made to the cooling tower to meet a specific cooling load?
- What will the performance be with a different fill?

FAN SPECIFICATION

- A database of fan curves can be created in the software.
- A curve fitting module is included in the software to generate fan performance polynomials. Two or more fan curves can also be compared to one another.
- The software will find the operating point if a fan curve is entered into the software. The point where the system resistance line intersects the fan curve is shown on output graphs.
- A fan sizing tool is included to determine the minimum height of the plenum chamber, the fan cover ratio and the number of fans.

ABOUT THE DEVELOPER

The owner and developer of WetCooling Software is ***Chris Kloppers.*** He did his PhD with the title of "A Critical Evaluation and Refinement of the Performance Prediction of Wet-Cooling Towers".

He has published papers on cooling towers in many of the leading academic journals of the world including:

- Transactions of the ASME: Journal of Engineering for Gas Turbines and Power
- International Journal of Heat and Mass Transfer
- Applied Thermal Engineering
- Heat Transfer Engineering
- Numerical Heat Transfer
- International Journal of Thermal Sciences
- Engineering Optimization

SOFTWARE DEMO VIDEOS

Visit www.wetcooling.com for **demo videos** on the capabilities of the software and how to use the software.

CONTACT DETAILS

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www.wetcooling.com

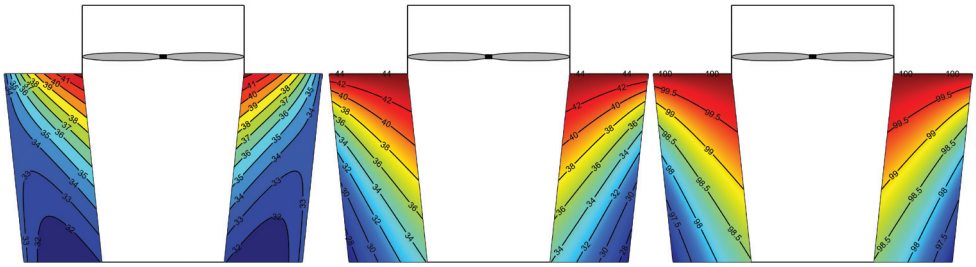
www.instagram.com/ wetcoolingsoftware

www.linkedin.com/company/ wetcooling-software/

youtube.com/ @wetcoolingtowersoftware

CROSSFLOW OUTPUT FIELDS

If the Merkel and Poppe methods are employed for crossflow towers, the value fields of various parameters can be viewed in two dimensions. Here are a couple of examples of the graphical output for a crossflow tower:



Air temperature

Water temperature

Water flow rate percentage indicating water loss due to evaporation

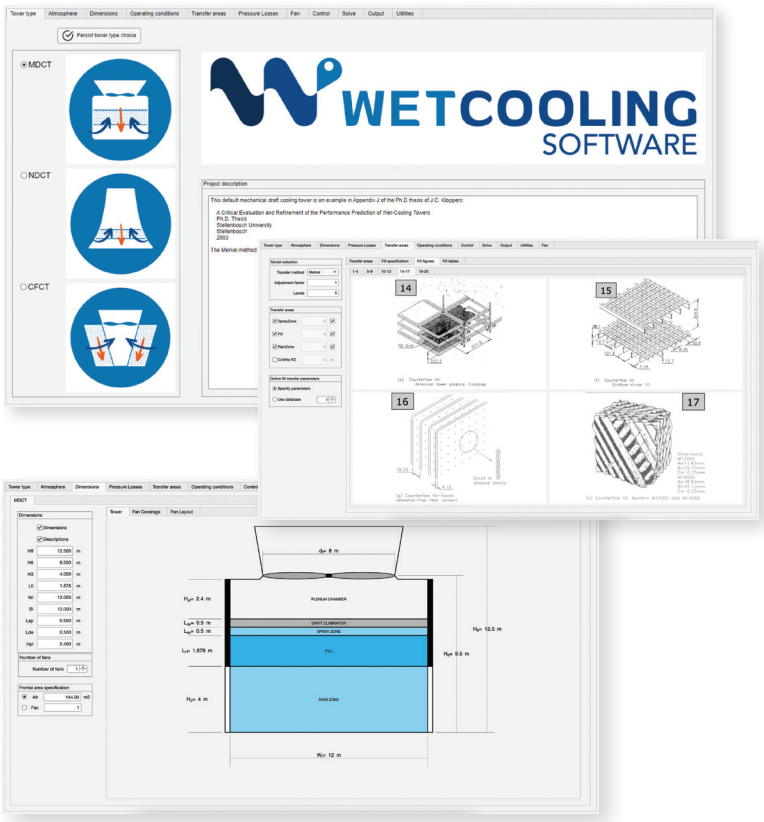
FURTHER DEVELOPMENT/ CONSULTATION

We can work with clients to change the software to meet firm-specific objectives, or we can act as independent consultants.

Ask us for a quotation to include fill transfer and pressure drop characteristics in the software.

THE SOFTWARE

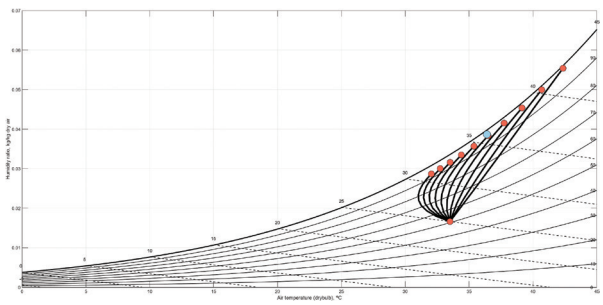
Some visual examples of the software interface:



VISIBLE PLUME ABATEMENT

The state of the air at the input and output of the cooling tower is presented on psychrometric charts that can also show the state of the air in the supersaturated state. The rigorous Poppe method can be employed to accurately calculate the properties of the air at the outlet. The propensity for a visible plume to form can then be determined.

Example of a psychrometric chart for a crossflow cooling tower where the air follows different paths through the tower.



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