



## CYMHARMO - Harmonic Analysis

CYMHARMO is the Harmonic Analysis Module of the CYME power engineering software. It features various analyses, including frequency scan, voltage distortion and current distortion calculations on balanced and unbalanced systems; and covers both single phase and full three-phase modeling capabilities. CYMHARMO utilizes state of the art sparse matrix/vector methods with a three-phase nodal admittance network matrix representation.

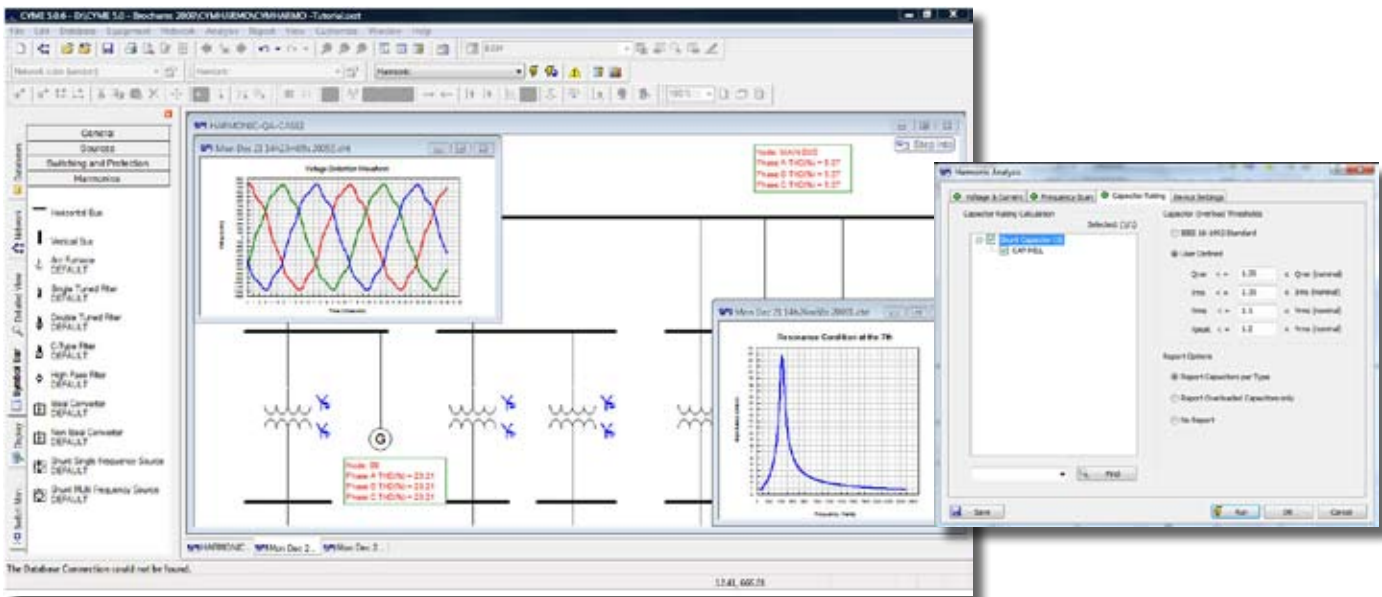
### Program Features

CYMHARMO includes a number of analyses, including frequency scan, voltage distortion and current distortion calculations on balanced and unbalanced systems. CYMHARMO allows the user to easily detect resonant frequencies due to capacitor banks, and to model non-linear loads and other sources of harmonic currents such as converters and arc furnaces. These capabilities make it possible to evaluate the impact of non-linear loads on the electrical network.

The module features both single phase and full three-phase modeling capabilities, with the flexibility to make the program easily adaptable to utility-type grids, industrial power systems and distribution feeders of any configuration.

CYMHARMO utilizes state of the art sparse matrix/vector methods with a three-phase nodal admittance network matrix representation.

The program interfaces with CYMFLOW or CYMDIST to obtain the fundamental frequency current and voltage system profile for harmonic distortion calculations and waveform display.



# CYMHARMO - Harmonic Analysis

Perform frequency scan, and voltage distortion and current distortion calculations on balanced and unbalanced systems

## Analytical Capabilities

- Phase or sequence analysis
- Driving point and transfer point frequency scanning analysis
- Harmonic voltage distortion analysis
- Harmonic current distortion analysis
- Calculation of telephonic interference indices (TIF, IT, etc.)
- Sensitivity analysis
- Harmonic cancellation analysis
- System detuning analysis
- Capacitor stress analysis
- Skin effect modeling
- User defined distortion limits or as per IEEE 519™ 1992 standard
- Selection of line/cable models: series R-L, nominal PI, transposed distributed parameters, etc.
- Selection of load models: (Parallel R-L, CIGRE C-Type, etc.)

## Capacitor Stress Analysis

CYMHARMO features a module for the stress analysis of all power capacitors installed in the network, including those incorporated in filters.

The analysis reports the harmonic currents and voltages of each capacitor as well as the total reactive power, RMS current, RMS voltage and peak voltage.

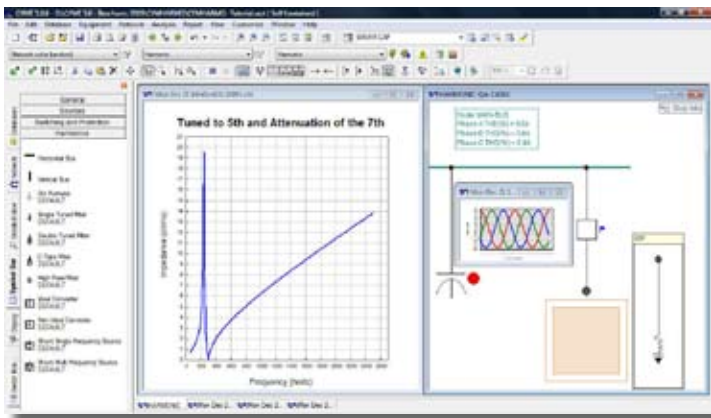
These quantities will be compared to IEEE 18™ 1992 standard limits or to user defined limits. Any capacitor, present in the system, which violates any of those limits, will be reported and highlighted on the network one-line diagram.

## Equipment Library

The users can model multiple types of harmonic sources to compute the effectiveness of filters and modify them at will in order to attain acceptable level of harmonic distortion indices on your network.

CYMHARMO includes an extensive library of equipment such as:

- Ideal and non-ideal converters
- Generic single or multiple frequency current and voltage source models
- Arc furnace model
- Passive shunt filter models comprising single tuned, high-pass, double tuned and C-type
- Library of single phase and three-phase transmission line and cable models, series R-L, nominal PI and distributed parameters
- Synchronous and induction motor models
- Single phase and three-phase transformer models allowing harmonic cancellation through their phase shift angles
- Modeling harmonic sources of nonlinear loads
- Static load modeling: parallel R-L and CIGRE C-Type



CYME International ( part of Cooper Power Systems)

1485 Roberval, Suite 104  
St-Bruno, QC Canada J3V 3P8  
P: 450.461.3655  
F: 450.461.0966  
P: 800.361.3627 (Canada and USA)

www.cyme.com | www.cooperpowereas.com  
info@cyme.com