DESKTOP ENHANCED MARK VII HPDM -- OPERATING INSTRUCTIONS

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The Mark VII HPDM needs one or two text input files to run successfully, depending on whether you wish to run single-point or parametric cases. The default input file names are HPDATA.DAT and PARAMS.DAT.

Both interactive and batch versions of the model are provided in separate folders.

To run either model, double-click on the respective executable programs (Mark7_W2_Interactive. exe or Mark7_W2_Batch.exe).

For the interactive model:

The interactive version will open a PC/DOS window and ask if you want to run parametrics (if you answer N, it will proceed for a single-point run) and then it will ask whether the input file(s) are the default text file names above or others. Upon answering these questions, the program will run and the PC/DOS window will close, leaving output files in the same directory as the executable.

For non-parametric single-point runs, the program reads by default the file HPDATA.DAT. The default outputs for this run are an OUTPUT.DAT file giving a detailed output listing and a WEBOUT01.DAT summary output file containing results as shown on the web output page. If a user-specified filename is provided, the detailed output listing will have the same filename with an .LST extension along with the WEBOUT01.DAT summary output file.

(Through the interactive input, the user can specify other filenames for the input file or files, limited to 8 characters for the filenames and 3 characters for the file extensions.)

For parametric single-point runs, the program reads by default the file HPDATA.DAT and PARAMS.DAT.

The default outputs for this run are a PARAMS.LST detailed output listing, a PARAMS.TAB parametric output, and the WEBOUT01. DAT summary output file with results as shown on the web output page.

For multi-point parametric runs, the program reads by default the file HPDATA.DAT and PARAMS.DAT.

The default output for these runs are a PARAMS.LST detailed output listing of all runs, a PARAMS.TAB parametric output and no WEBOUTxx.DAT files. With an optional setting of the IOUTPFLG variable in the PARAMS.DAT file, a WEBOUTxx.DAT summary output will be written for each parametric point.

For the parametric runs with user-named HPDATA or PARAMS files, the user can choose to have the *.LST and *.TAB outputs named by the HPDATA or the PARAMS filename.

The available options for parametric variable selections in the PARAMS.DAT file are listed in the companion text file "Parametric_Options_By_ID#.pdf" and in the Excel template.

Control functions can also be specified in the PARAMS.DAT file to vary selected input parameters as functions (either linear or quadratic one- or two-variable) of other model inputs.

The default *.TAB output is 150 dependent parameters, but the user can modify the Excel Setup Template inputs on the PARAMS tab to the NDVSS and IDVSS lines to limit the output to only those parameters of interest. Alternatively, the output can be limited after the cases are run by using the Viewer-Converter.exe tool discussed below.

For the batch model:

The program reads by default the HPDATA.DAT and PARAMS.DAT files located in the same folder as the executable. The default outputs for these runs are OUTPUT.DAT, PARAMS.OUT, and (optionally) WEBOUT01.DAT files.

Excel Template, Sample Setup Files, Cases, and Tools

Sample files are included for test runs in the Interactive Model folder. The provided Excel template with cell-by-cell input documentation and/or the example Excel-setup files can be used to generate your own input data sets by following the instructions at the top of each tab. The Excel template can be used in the HPDATA tab to generate data setups for air-to-air, water-to-air, air-to-water, and water-to-water cases for 1-, 2-, or variable-speed compressors (up to 10 speeds). In the PARAMS TAB, parametrics can be selected for 2- to 5-independent variables, with the optional capability of controlling other input parameters as functions of the parametric variables.

Included in the sample files are cooling and heating mode ASHP cases using R-410A and R-32 scroll compressor maps published in a 2013 ORNL test data contribution to the AHRI Low-GWP Alternative Refrigerants Evaluation Program (TEST REPORT #11). There is also a sample params1P.dat file as an example of the setup to run a single-point case with full single-point parametric output (PARAMS1.TAB).

Also there is a sample case with R-410A setup as a two-component mixture, demonstrating the capability to specify other refrigerant mixtures by selecting R-mix from the pop-up menu for the NR input parameter and providing their REFPROP component filenames (from the fluids subfolder) and molar fractions (up to five components) from the mixtures subfolder. Note that a compressor map developed for such mixtures is also recommended for accurate performance predictions. Users should also note that for mixtures of more than two components, the run time will increase proportionally from <30 seconds, up to 4 or 5 minutes; this is because for component-specified mixtures, we are calling REFPROP 9.1 directly for each property call throughout the iteration process. In contrast, when the 4 available HFC mixtures are called by name (R-404A, R-407C, R-410A, and R-507), we use NIST pseudo-

pure thermodynamic properties and ASHRAE transport property correlations which execute much faster.

Last, we also provide cooling and heating mode WSHP cases (with an outdoor w-to-refrigerant coil) using the same R-410A scroll compressor map. This shows an example using the fluted-tube HX model based on the work of Rousseau P.G., M. van Eldik, G.P. Greyvenstein, "Detailed simulation of fluted tube water heating condensers", International Journal of Refrigeration 26 (2003) 232–239. The WSHP cases can also be run with smooth tubes if desired. Calibration against heat exchanger lab data with the HTRML(I,O), PDRML(I,O), and PDAML(I,O) values are recommended, assuming that the HTAML(I,O) values are 1.0 when water is flowing in the inner annulus. The geometry inputs are described in a companion document online on the HPDM web site and should be used in conjunction with the technical paper by Rousseau et al (2003).

Note also that for cases where the user specifies water or glycols instead of air as the external fluid(s), with user settings for ITYGLI or ITYGLO in the HPDATA.DAT file, references to air-side values in the output files should be interpreted as those for whatever external fluid was selected.

<u>One note with regard to parametrics involving a range of indoor or outdoor dry bulb temperatures.</u> Care should be taken that the companion humidity settings should either be relative humidity or humidity ratio values rather than wet bulb temperatures. In the input template, we have set the outdoor humidity settings for ASHP cases to fixed RH values for this reason, while the indoor conditions are set with the more recognizable web bulb settings.

The output format for the PARAMS.TAB files in the provided samples is as discussed in ORNL/CON-343. It is written as would be seen on a contour plot of dependent values as a function of independent x-y values, i.e., Z values with the following x-y inputs.

x1y3 x2y3 x3y3 x4y3

x1y2 x2y2 x3y2 x4y2

x1y1 x2y1 x3y1 x4y1

A conversion tool is provided in a separate folder (Parametric Output Viewer-Converters) to display the parametric output results in a more conveniently labeled format along with an x1,y1, z1,....zN formatted file more suitable for input to many contour plotting programs. Also, an Excel alternative is provided with an example of how to use the output file to generate a more conventional Z vs X plot for families of y-values.