# T H E R M O P T I M ®

# USE OF THE

# DATA EXTRACTION UTILITY

# FOR POST-PROCESSING

**VERSION JAVA 1.6**

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# Use of the data extraction utility for post-processing

For a given Thermoptim diagram file, there can be many possible project files corresponding to different parameter settings of the model. Starting from the Standard version of the software package, there is a function that allows sensitivity studies to be carried out, but it only keeps track of a very small number of parameters.

Let us look at the structure of Thermoptim project files (Figure 1): the various settings are placed in text fields separated by tab characters, so that each of them appears in a well-defined cell if the file is opened in a spreadsheet as if it were a worksheet. As can be seen in Figure 1, each cell contains either a value (the point enthalpies are given in column F, from row 25 to row 29) or an "identifier=value" pair (for example cells J38 and K38, which give the air factor and the combustion end temperature of the combustion chamber).

| | A | B | C | D | E | F | G | H | I | J | K | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | | | | | | | | | | | | |
| 13 | GAZ COMPOSES | 1 | | | | | | | | | | |
| 14 | Nom du gaz / Compc | fraction molaire | fraction massique | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | gaz_brulés | 5 | | | | | | | | | | |
| 17 | CO2 | 0.0300102171 | 0.0461435625 | | | | | | | | | |
| 18 | H2O | 0.0558075615 | 0.0351258346 | | | | | | | | | |
| 19 | O2 | 0.146182519 | 0.163426215 | | | | | | | | | |
| 20 | N2 | 0.759252709 | 0.743095723 | | | | | | | | | |
| 21 | Ar | 0.00874699359 | 0.0122086651 | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | POINTS | 5 | | | | | | | | | | |
| 24 | nom | nom corps | T (°C) | P (bar) | titre | h (kJ/kg) | u (kJ/kg) | V (m3/kg) | | | | |
| 25 | combustible | gaz_de_Montoi | 15 | 20 | 1 | -20.52071046 | -16.0726432 | 0.065061450 | open_syst=true | calc_pT=true | set_Tsat=false | DTsat |
| 26 | entrée d'air | air | 15 | 1 | 1 | -9.87037072 | -7.0423588 | 0.827301151 | open_syst=true | calc_pT=true | set_Tsat=false | DTsat |
| 27 | 2 | air | 494.0741210 | 20 | 1 | 488.7162350 | 353.9983257 | 0.110138018 | open_syst=true | calc_pT=true | set_Tsat=false | DTsat |
| 28 | 3 | gaz_brulés | 1150 | 20 | 1 | 1295.047922 | 968.2246053 | 0.206691821 | open_syst=true | calc_pT=true | set_Tsat=false | DTsat |
| 29 | 4 | gaz_brulés | 494.0008789 | 1 | 1 | 505.5396007 | 369.2649293 | 2.22834995 | open_syst=true | calc_pT=true | set_Tsat=false | DTsat |
| 30 | | | | | | | | | | | | |
| 31 | TRANSFOS | 6 | | | | | | | | | | |
| 32 | nom | point amont | point aval | type | m ?H | type_ener | débit | | | | | |
| 33 | sortie gaz | 4 | 4 | Exchan | 0 | other | 1.01701206 | open_syst=tr | set flow=false | calc_direct=fals | min pinch DT=0 | pinch |
| 34 | entrée d'air | entrée d'air | entrée d'air | Exchan | 0 | other | 1 | open_syst=tr | set flow=false | calc_direct=fals | min pinch DT=0 | pinch |
| 35 | combustible | combustible | combustible | Exchan | 0 | other | 0.017012060 | open_syst=tr | set flow=false | calc_direct=fals | min pinch DT=0 | pinch |
| 36 | compresseur | entrée d'air | 2 | Compre | 498.59 | useful | 1 | open_syst=tr | set flow=false | rend=0.85 | isentr=false | calc_( |
| 37 | turbine | 3 | 4 | Expans | -802.94 | useful | 1.01701206 | open_syst=tr | set flow=false | rend=0.85 | isentr=false | calc_( |
| 38 | chambre de combust | 2 | 3 | Combus | 828.36 | purchased | 1.017012 | open_syst=tr | set flow=false | lambda=3.5241 | Tfluegas=1423.15 | disso( |

*igure 1: Extract from a Thermoptim project file*

A data extraction utility called DataExtractor-en has been developed in Java to enable relatively easy post-processing of a set of project files relating to the same model and therefore with an identical or similar structure (Figure 2). It allows project files to be loaded and then the values chosen by the user to be extracted from the cells of the different files, whether they are simple values or "identifier=value" pairs. Its use is explained below.

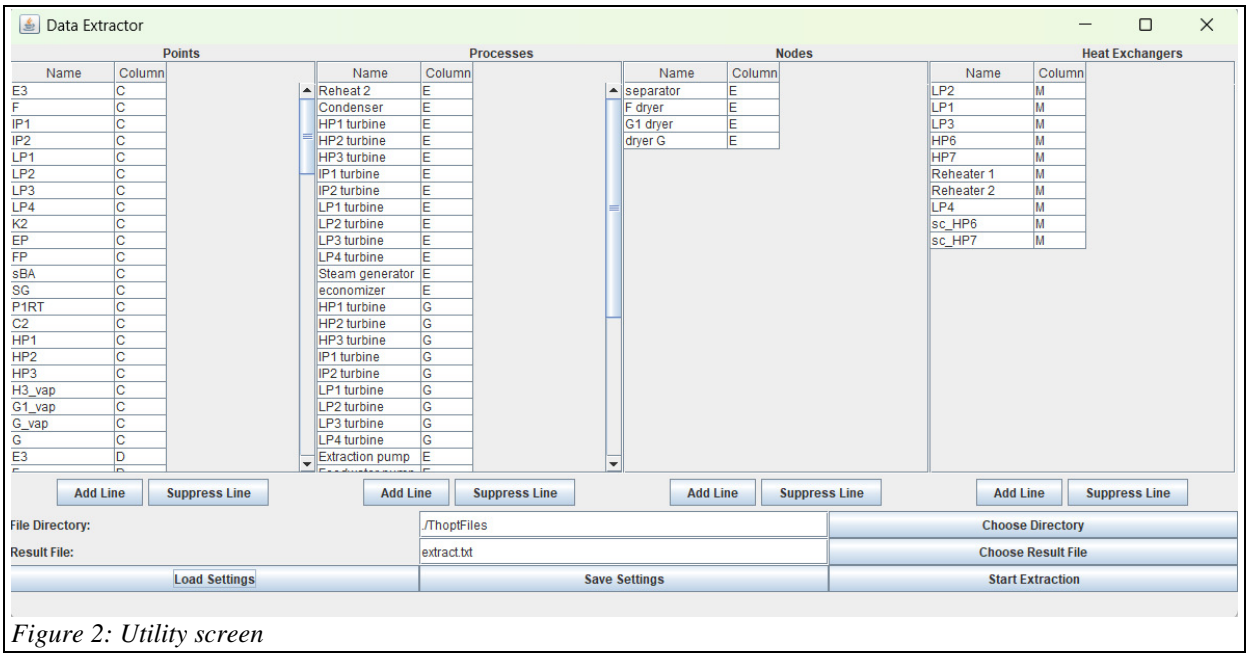


*Figure 2: Utility screen*

## *Definition of the values to be extracted*

The utility contains four main tables corresponding to points, processes, nodes and heat exchangers. Each table has two columns: the first gives the names of the elements, and the second the column of the value to be extracted. In Figure 2, for the points, the first table shows that the values from column C (temperature) are to be extracted for the listed points, then from the last complete line, those from column D (the pressure). For the processes, columns E and G (enthalpy involved and flow rate), and so on.

At the bottom of each table, two buttons allow a row to be added or deleted. To edit a row, simply change the desired value.

At the bottom of the window are the buttons and fields used to select the working directory, the extraction file and to modify the parameter file, whose default name is “param.txt”.

The working directory is the one where all the files from which you want to extract data are placed.

Finally, the button in the bottom-right corner is used to start the extraction.

The parameter file can, as just described, be built from the utility window, but it is a text file that can also be created manually in a text editor or a spreadsheet.

Figure 3 shows the end of the parameter file that was loaded in Figure 2. It contains the names of the elements and their column, preceded by an identifier specifying their type, with a comma as the separator.

```
140  PROCESSES,LP1 turbine,J
141  PROCESSES,LP2 turbine,J
142  PROCESSES,LP3 turbine,J
143  PROCESSES,LP4 turbine,J
144  PROCESSES,Extraction pump,J
145  PROCESSES,Feedwater pump,J
146  PROCESSES,LP2 pump,E
147  PROCESSES,LP3 pump,E
148  PROCESSES,LP4 pump,E
149  NODES,separator,E
150  NODES,F dryer,E
151  NODES,G1 dryer,E
152  NODES,dryer G,E
153  HEAT EXCHANGERS,LP2,M
154  HEAT EXCHANGERS,LP1,M
155  HEAT EXCHANGERS,LP3,M
156  HEAT EXCHANGERS,HP6,M
157  HEAT EXCHANGERS,HP7,M
158  HEAT EXCHANGERS,Reheater 1,M
159  HEAT EXCHANGERS,Reheater 2,M
160  HEAT EXCHANGERS,LP4,M
161  HEAT EXCHANGERS,sc_HP6,M
162  HEAT EXCHANGERS,sc_HP7,M
```

*Figure 3: Parameter file*

## *Post-processing*

The extraction file is a text file structured like a spreadsheet, with a first column containing the names of the elements, followed by as many columns as there are files processed.

The first row contains the names of the project files processed, and each subsequent row starts with the name of the variable to which is concatenated the name of the variable if it is standard, or otherwise the column identifier, followed by all the values found, separated by tab characters.

After all these data, the values are grouped in the following rows by type (temperatures, pressures, etc.) to make them easier to use later in spreadsheets.

The decimal separator used in the result file is the dot “.”. It may be necessary to replace it with the separator used by your computer system.