

## Elaboration of IT tools for Thermophysical Calculations: Methods and Properties of Substances

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Thermophysical property databases of technical substances and predictive models are key elements of a reliable design for energy transformation units. Some tables and algorithms can be found on the Internet to determine thermophysical properties,  $R$ , of substances. The set of predictive thermophysical property models of working media is analyzed and opportunities of various Internet resources are discussed. The features of thermophysical calculations ( $TC$ ) with usage of the Internet can be divided on two groups [1]: a) a client searches tabulated values  $R$  of a substance in the Internet; b) a client accepts an Internet resource to calculate  $R$  and starts  $TC$  using some border conditions  $Y$ . There are following objects studied in this report:

1)  $TF$  - resources in the form of text files those contain tabulated values of  $R = (P, T, v, h...)$ , 2)  $EF$  - resources or closed objects those contain exe-files, 3)  $OF$  - resources or open interactive algorithms.

$EF$  - resources [1,2] include exe-files those are used by clients in  $TC$  calculations of properties  $R$  of various working media.

Our analyses shows:  $OF$  - resource is a complicated Internet object. For example, a client can calculate properties  $R$  in the Internet portal where  $OF$  - resource is placed; he should provide the next steps: 1) to introduce the input parameters  $Y = (P, T, ...)$  for a specified substance, 2) to start corresponding calculations, 3) to copy the result  $R(P, T)$ . The advantage of the  $OF$  - resource is underlined and additional facilities for a client in a comparison with  $EF$  - resource are introduced via the 4 - th step: to copy mathematical formulas ( $MF$ ) those are included in  $OF$  - resource to determine  $R(Y)$ .

The  $OF$  - resource is located in a special Internet portal and includes: 1) a program,  $Code-OF-PropertyR(Y)$ , that is used to determine  $R$ , 2) some operators connected with Internet technologies.  $Code-OF-PropertyR(Y)$  is written using *Mathcad* and includes  $MF$  formulas.

The set of  $OF$  - resource devoted to predict  $R$  property of working media is analyzed among them  $OF$  - resource those based on such equations as:  $P(\rho, T)$ , of the liquid and the gas phases,  $\rho_l(T)$ ,  $\rho_g(T)$ ,  $P_s(T)$  and other properties on the coexistence curve.  $OF$  - resource is created by authors in the form of "Data on thermophysical properties of substances and engineering calculations" [3]. In the case a client chooses a proper  $Y$  condition (a substance,  $P, T$ -parameters *et al.*) and fulfills  $TC$ : for example, he can calculate properties  $R = (P, T, v, h...)$  of the water under certain conditions  $Y$ . These  $TC$  are based on the formulation *IF-97* which contains about a hundred of equations. An information technology of «*Mathcad Calculation Server*» is accepted in this Internet object. Emerging applied problems are analyzed via modeling  $R$  property of substances (the water, R134a, the ethanol *et al.*) with usage of the Internet in the report.

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### References

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2. Internet portal NIST, 2002
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