

**Development of a new digital model based on genetic algorithm  
to characterize physical properties of petroleum fractions**  
2014/2015



**Réalise par:** Aidouni sadam houssine, abidi abd elhadi **encadrée par:** belghit Chafik

**Université Kasdi Merbah Ouargla**

**Filière:** Génie des procédés

**Option:** Génie chimique

**aidou911@gmail.com**



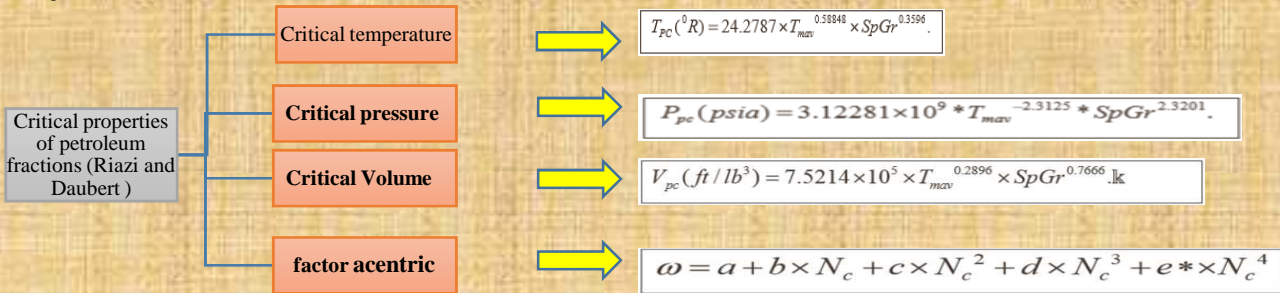
**Abstract:**

There must be Different techniques in order to determine physical and thermodynamically properties of hydrocarbon products. However, in most cases these techniques are lengthy and require costly equipment. Thurs, other methods based on numerical and graphical approaches are followed.

Our study aims to determine the critical properties of petroleum fractions using the genetic algorithms.

**problematic :**

Our concern is to optimize the coefficients of a computational model of a given property, this by developing a program that optimizes the coefficients in a field of research. This area varies from property to another, and depends on the model chosen..

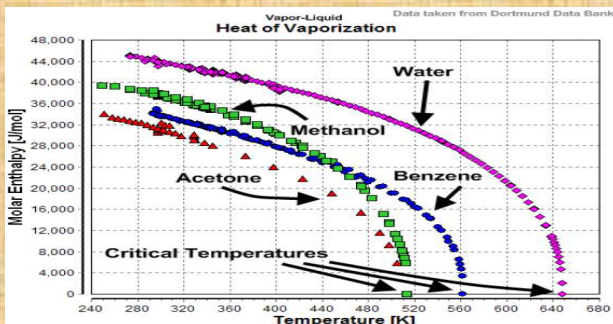
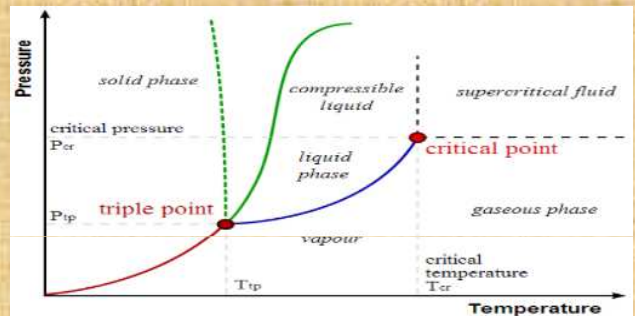


**Critical point:**

A critical point, also known as a critical state, occurs under conditions (such as specific values of temperature, pressure or composition) at which no phase boundaries exist. There are multiple types of critical points, including vapor-liquid critical points and liquid-liquid critical points.

Pure substances: vapor-liquid critical point

The term "critical point" is sometimes used to specifically denote the vapor-liquid critical point of a material, above which distinct liquid and gas phases do not exist.



On the PT diagram, the point at which critical temperature and critical pressure meet is called the critical point of the substance. Above the critical temperature, a liquid cannot be formed by an increase in pressure, even though a solid may be formed under sufficient pressure. The critical pressure is the vapor pressure of material at the critical temperature. The critical molar volume is the volume of one mole of material at the critical temperature and pressure.

Critical properties vary from material to material, and for many pure substances are readily available in the literature. Nonetheless, obtaining critical properties for mixtures is more challenging.

**MATLAB (matrix laboratory)**

is a multi-paradigm numerical computing environment and fourth-generation programming language. Developed by Math-Works, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, Fortran and Python. Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing capabilities. An additional package, Simulink, adds graphical multi-domain simulation and Model-Based Design for dynamic and embedded systems.

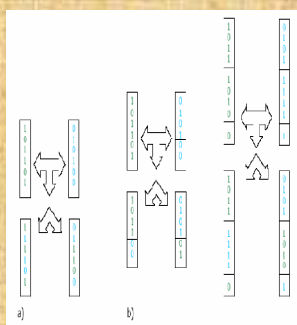


**What is Petroleum?**

- A complex mixture containing thousands of different organic hydrocarbon molecules
- 83-87% Carbon
- 11-15% Hydrogen
- 1-6% Sulfur
- Paraffins – saturated chains
- Naphthenes – saturated rings
- Aromatics – unsaturated rings

**Genetic algorithms:**

Those two words got a deep means on it, our work use genetic as a first face which is mention to the physical properties of the petroleum fractions, that we will give it a codes, and from the other face, algorithms mention to the mathematical correlations that will use as program on Matlab.



**Conclusion:**

Knowledge of the physic-chemical properties of petroleum fractions becomes necessary and it uses differences techniques. However, in most cases, the methods used are lengthy and require expensive equipment. That is why those techniques are often replaced by computational methods, correlations and even by graphic approaches, to fully meet the objectives of the engineer who must know the details and the quality of each product used in these units.

**References:**

- W.C. Edmister, B.I. Lee, Applied Hydrocarbon Thermodynamic, vol. 1, seconded., Gulf Publishing Company, Houston, TX, 1993.
- M.G. Kesler, B.I. Lee, Hydrocarbon Process. 55 (1976) 153-158.
- P. Hosseinifar, S. Jamshidi / Fluid Phase Equilibria 363 (2014) 189-198
- M.R.Riazi et T.E.Daubert, ind.Eng.Chem process, des dev 25-1009 (1986).