

## ■ Conclusions

Changes in humidity of the test papers stored in different conditions have a significant impact on the value of breaking energy, both in the machine and cross direction. Both methods proposed for breaking energy calculation for papers conditioned at a given temperature and different humidity can be useful in certain practical applications. *Equation (7)* allows to calculate paper breaking energy on the basis of coordinates of two breaking points determined after paper conditioning at a given temperature and two different relative humidity values. However, first the method requires determining coefficient  $h$  for a given paper or a group of papers of the same type. It is possible to use *Equation (12)* when tensile curves of paper are known after its conditioning at a defined temperature and two different relative humidity values. Apart from that, this relationship allows to calculate the energy at any moment of the tensile test and not only at the moment of breaking. Determination of the values of breaking forces and strain at the moment of breaking with *Equations (13)* and *(14)* in the range of high humidity, above 80%, can involve serious error.

## References

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# INSTITUTE OF BIOPOLYMERS AND CHEMICAL FIBRES

## LABORATORY OF ENVIRONMENTAL PROTECTION

The Laboratory works and specialises in three fundamental fields:

- **R&D activities:**
  - research works on new technology and techniques, particularly environmental protection;
  - evaluation and improvement of technology used in domestic mills;
  - development of new research and analytical methods;
- **research services** (measurements and analytical tests) in the field of environmental protection, especially monitoring the emission of pollutants;
- **seminar and training activity** concerning methods of instrumental analysis, especially the analysis of water and wastewater, chemicals used in paper production, and environmental protection in the paper-making industry.

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- Research and development of waste water treatment technology, the treatment technology and abatement of gaseous emissions, and the utilisation and reuse of solid waste,
- Monitoring the technological progress of environmentally friendly technology in paper-making and the best available techniques (BAT),
- Working out and adapting analytical methods for testing the content of pollutants and trace concentrations of toxic compounds in waste water, gaseous emissions, solid waste and products of the paper-making industry,
- Monitoring ecological legislation at a domestic and world level, particularly in the European Union.

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- Global water & waste water pollution factors: COD, BOD, TOC, suspended solid (TSS), tot-N, tot-P
- Halogenoorganic compounds (AOX, TOX, TX, EOX, POX)
- Organic sulphur compounds (AOS, TS)
- Resin and chlororesin acids
- Saturated and unsaturated fatty acids
- Phenol and phenolic compounds (guaiacols, catechols, vanillin, veratrols)
- Tetrachlorophenol, Pentachlorophenol (PCP)
- Hexachlorocyclohexane (lindane)
- Aromatic and polyaromatic hydrocarbons
- Benzene, Hexachlorobenzene
- Phthalates
- Polychloro-Biphenyls (PCB)
- Carbohydrates
- Glyoxal
- Glycols
- Tin organic compounds

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