

PM Lithodata and PM Techmodel

A data bank and prediction software for
properties of construction aggregates



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ABSTRACT

The aim of this article is to introduce new prediction software, the PM Techmodel for statistical analysis of aggregate test results. Techmodel can be used for prediction of different technical properties and for pinpointing of redundant properties and test methods. In addition, a data bank containing properties of aggregates in different regions is introduced, the PM Lithodata. The bank's function is to collect test results for model building in PM Techmodel and at the same time to produce data for various market segments, which need reliable information on the properties of aggregates. These solutions are the first from Petromodel ehf., a knowledge-based company developing software and testing instruments for quality control in the aggregates industry.

Key words: aggregates, data bank, Lithodata, Petromodel, properties, software, Techmodel.

1. INTRODUCTION

Petromodel Ltd. (PM) is a knowledge-based company established in 1999, developing and marketing software and high-technical testing instruments for quality control in the

sand and gravel industry, as well as providing consultancy. In other words, Petromodel provides solutions assisting the industry in meeting the quality requirements of its customers.

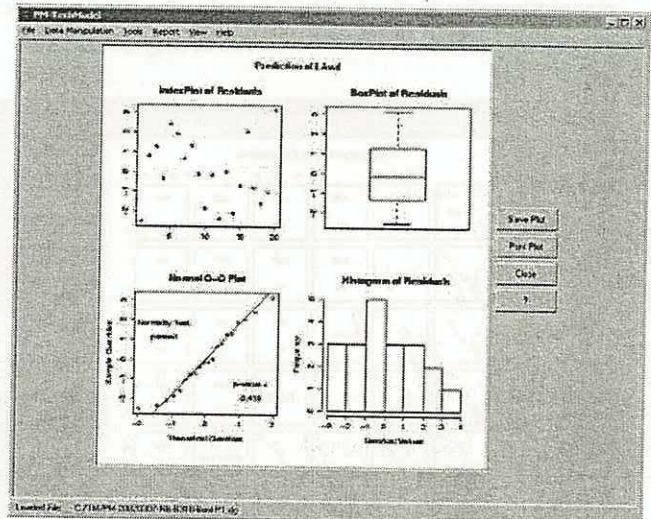


Figure 2: Screen shot from PM Techmodel;
Result of prediction for „LA“ variable⁶

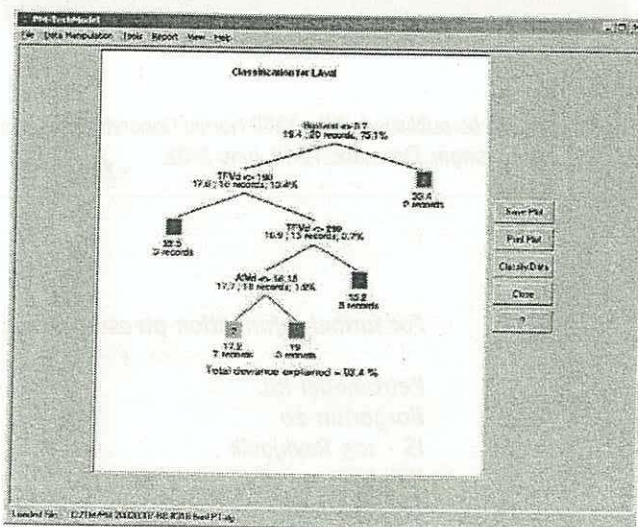


Figure 1: Screen shot from PM Techmodel;
A classification for „LA“ variable⁶

The company is collaborating with various institutions and companies in Europe in the development work. At present the company is developing three products or solutions: PM Techmodel and PM Lithodata, to be discussed in this article, and PM Petroscope. The aim of the Petroscope-project (EUREKA project no. 2569) is to develop an automatic instrument for analysing petrographic composition, size and shape of gravel particles.

2. TECHMODEL AND LITHODATA

The technical development approach of Petromodel is founded on theories of materials science. Based on various authors¹⁻⁴, it is stated that the technical (engineering) properties (characteristics; dependent variable; TP) of unbound aggregates are governed by fundamental properties (independent variables; FP) of the sand and gravel particles and surrounding fluid. This context can be described as follows:

$$TP = f(FP) = f(p, s, sh, pf)^1$$

where p is petrographic composition; s, size; sh, shape; and pf, pore fluid. The link or function, f can in rare cases be explained by a physical model, a causal connection. More often, one has to relate the fundamental properties by statistically derived equations based on experimental data, to the technical properties.

2.1 PM Techmodel

Petromodel Ltd. has taken on the task of developing the software to "statistically derive equations based on experimental data". PM Techmodel is a specialised prediction software program for statistical analysis of aggregate test results; for forecasting various technical properties (virtual testing); for classification of aggregates and properties, and pinpointing of redundant properties and test methods. Version 1.0 of PM Techmodel is to be released in May 2002.⁵

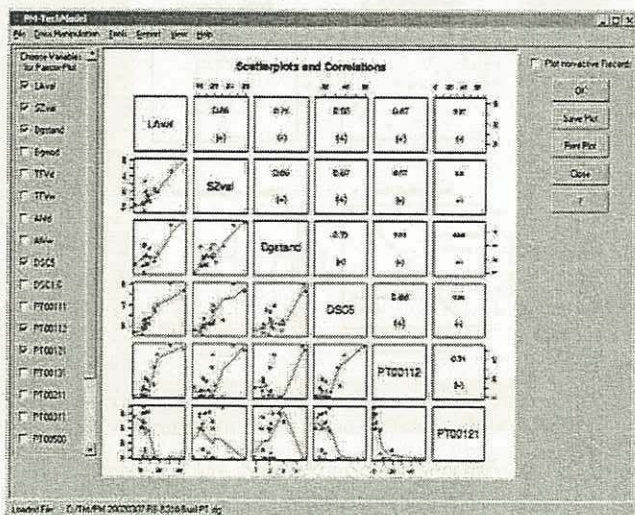


Figure 3: Screen shot from PM Techmodel; Correlation of four technical properties and petrographic composition with two different petrographic types⁶

Techmodel has been developed in Austria under the auspices of Petromodel, by Dr. Jürgen Pilz, professor of statistics at Klagenfurt University. When deriving the predictive equations, in practise one uses not only the fundamental properties as the independent variable, cf. eq.¹, but in many cases also one or more of the technical properties if they are known, cf. eq.² Figure 1 and 2 shows a screen shot from PM Techmodel regarding aggregates in 20 quarries in Iceland.

$$TP_Y = f(FP, TP_X) = f(p, s, sh, pf, TP_1, TP_2, \dots)^2$$

2.2 PM Lithodata

A data bank of aggregate properties in different regions or countries is being established by Petromodel, preliminary called PM Lithodata. The bank's function is, on the one hand,

to collect test results for developing models in PM Techmodel and on the other, to produce data for various market segments, which need reliable information on the properties of aggregates. Today, those needing such information must seek it from many parties to obtain sufficient information, but with the bank it will be possible to access the information in one place. Figure 3 shows the correlation data for properties of aggregates in 20 quarries in Iceland.

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