Control of production costs and quality of meat products

ERDŐS,Z. - CSIBA, A. - KÖRMENDY, L. - *LEHEL, K. :

Hungarian Meat Research Institute, Budapest; *Meat Packing Plant, Szombathely

The unstability of chemical composition in raw materials of the meat industry influences both the quality of meat products and the costs of production. In the Hungarian Meat Research Institute a complex regulatory system was worked out.

The system called PRODUCONT attains the required quality and profitable production mainly through controlling production formulas. Development and application of the formulas is executed in several phases. In the meantime, it gives the possibility to keep the specific features and organoleptic characteristics of the product, controlling its chemical composition, taking the daily raw material supply and trade orders into consideration.
The established new system alignments with the composition of raw materials and their standard deviation. The lesser the standard deviation the more effective is the quality and expenditure control. So it is very important to decrease standard deviation by technological methods. First of all, in the Meat Plant of Szombathely, the modernization of raw material preparation, and the establishment of a new meat classification system-ensuring more precise quality - were executed /1/. The application of a rapid analyzer and a great volume blender is under preparation, too /2/. By introducing standardization, a stable composition and small deviation can be ensured in the meat lots. Until it is realised,the raw materials are characterized by the calculation of running average deriving from the results of regular control and several analyses.
Sampling from the raw materials is also a special question. A new sampling method providing results through known standard deviation and planned precision has been worked out.
In table 1. sample masses belonging to requested standard deviation are shown according to the approximate fat content and particle size of the raw material. Table 1. was achieved by recalculation of analytical results of a great number of meat sample units with different particle size. /3/.
For calculating production formulas, a mathematical model was set up. In reality, it is a system of equations in which the relations of the quantity and composition of raw material are related with the prescribed composition of the final product by the help of conditional equations. Beside them, there is a target function taking raw material price into account /Fig.1./.

The standard deviations in the composition of the respective raw materials are also presented in the system of equations.

Through the calculations we obtain what actual composition is needed for assuring the prescribed chemical composition of the final product on a given level of statistical probability.
The comfortable application of the model is supported by a program composed on microcomputer. It is possible to take max.2o kinds of raw material simultaneously into account. Several variations of formulas are calculated on individual products. They are accepted after experimental production and organoleptic test. They are not standard formulas,after all. The regular control of raw materials makes it possible to test the prevailing set of formulas because of actual raw material quality and eventual price changes periodically. By the help of an aimingly composed computer program it can be selected which formulas deviated from an acceptable interval of composition and costs because of changes in the raw material composition. In this case they are corrected by the help of the above mentioned calculating program. The periodical change of the formulas fallows the raw material composition and assures steady final product quality. After such "re-optimations" no experimental productions are needed. So the variations in the formulas give controlled composition, organoleptic quality and least possible raw material costs. From these variations those formulas must be daily selected which give the minimal production costs, at the disposable raw material stock and actual trade orders.
This latter problem is also solved by a mathematical model. The selection of formula can be executed by the help of an algorhythm "back-track" with microcomputer - and fairly good speed and efficiency. The program examines a great number of production combinations and the products are enlisted in a special preference order on the matrixes. The program may require reserve or additional amounts of raw materials. In this case it always denotes the level of the additional financial result. The operator of the program may give permission of using additional raw material with knowledge of the factory and market conditions. This assures great flexibility in the use of the program. The calculating, testing, formula-selecting programs together with other additional ones furnish a system of programs. /Fig.2./.
In the meat plants of Szombathely and Gyöngyös, teams were organized for the application of this production control system. In these places beside the daily functions the production and final product control data are regularly analyzed. So e.g. if organoleptic objections are found repeatedly in the case of a given formula the team may cancel it from the system.
During the last years, beside a stable quality level, a considerable economy of raw materials was registered.

Figure 1.

mathematical model for calculation of formulas

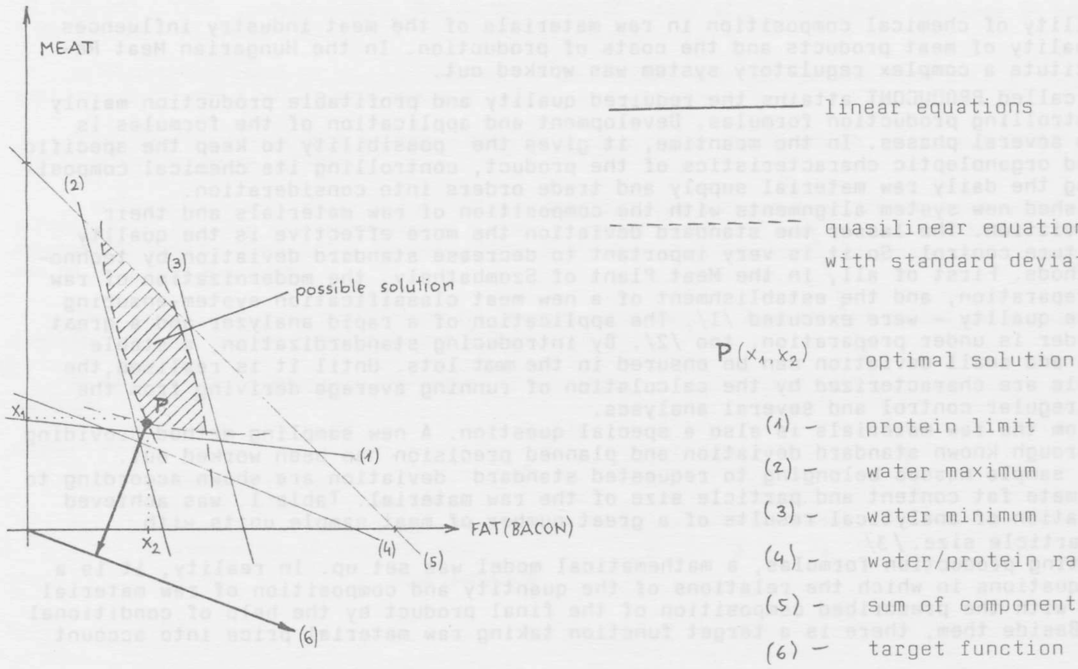

Figure 2. system of programs and organisation

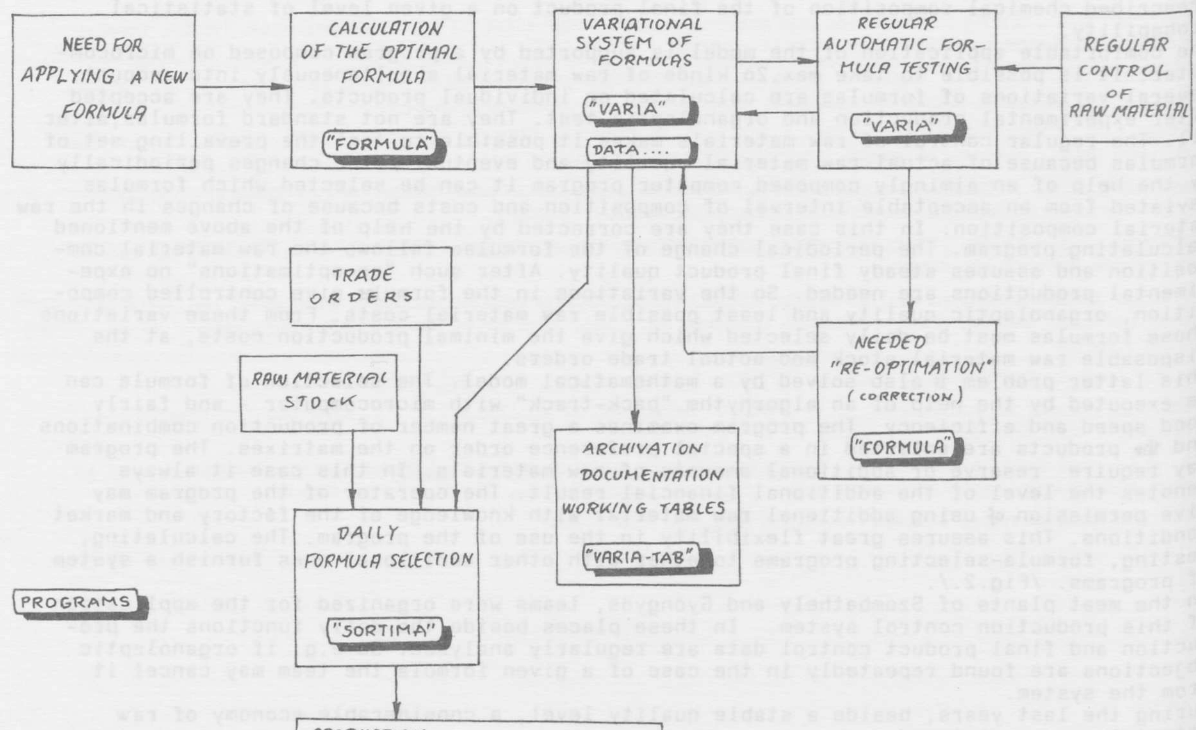

Table 1. Sample mass and standard deviation

permissible standard deviation	approximate fat content	particle size of meat /mm/						
		2	3	5	13	20	40	
s = 0.8	cca. 10 %	150	150	350	490	830	1090	/g/
	cca. 40 %	300	580	580	3300	3300	4560	
s = 1.2	10	70	70	160	220	370	490	
	40	130	260	260	1470	1470	2030	
s = 2.0	10	20	20	60	80	130	180	
	40	50	90	90	530	530	730	

LITERATURE

/1/ LEHEL,K.: Húsipar,31 /1982/, 4, p.164

/2/ DÓCZI,I, et al.: Húsipar,32 /1883/,4, p.145.

/3/ SCHÖBERL, E., et al.: /sampling from raw meat/ Die Nahrung - FOOD, 30 /1986/ in press