SYSTEMATIC DECOMPOSITION AND CONCEPTUAL MODEL OF THE COMPLEX INDEX OF EXTRUDATES QUALITY

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Keywords: system analysis, extrudates, quality, model, decomposition

Introduction

The problem of increasing the quality of extrudates is connected with six main aspects: preservation of and increase in food value (FV) improving structural-mechanical (SMI), functional-technological (FTI), organoleptical (OI) and safety indices (SI), and of the microstructure (M) of the products.

The model of the complex index of the extrudates quality can be presented as follows:

$K = < K_{FF'} K_{SMI} K_{FTI} K_{OI} K_{SI} K_M >$, where $K_{FV} K_{SMI} K_{FTI} K_{OI} K_{SI} K_M$ are the models of *FV, SMI, FTI, OI, SI and M,* respectively.

To describe the problem of increasing quality of extrudates, allowing us to single out system components and determine the general system characteristics, the authors used the model of the purpose-oriented functioning of the system:

<purpose> ↔ <strategy> ↔ <resources>

The purpose determines the necessity of creation and development of the system. The purpose can be defined as a set $W_{(x)}$ of states $X_{(t)}$ of the system S, corresponding to the desired level of the complex index of quality (X(t) Ђ W(x)), and desired by the person, taking a decision (PTD), where t is time.
The description of the set W (x) consists of the formation of limit values on the vector X(t) (quantitative and qualitative) and in assigning to the vector E (W) the properties of the purpose (the vector of efficiency) which can be considered preferable (or which the PTD considers to be the preferred ones).
As the purpose states (X(t) Ђ W(x) can be achieved in three different ways (strategies), then in the general case there is a set Ω (Y) of strategies Y (t), (Y) (t) ∈ Ω (Y), realizing the purpose W(x). The set Ω (Y) determines the function of the system and can be assessed by the vector of evaluation E (Ω).

Materials and Methods

The resources {d(t)} are the properties (material, power, finance, intellectual, *etc.*) that are necessary and sufficient for realisation of the function of the system S. The limited number of resources d(t) determines some field D(d) (d(t) Ђ D(d), the efficiency of which is designated through the vector of criteria E(D). The components of this vector can be: sufficient number of resources, their mobility, intensity of use, *etc.* It should be noted that the resources can be independent and interchangeable. As resources we understand all the means (initial raw materials, method and degree of their comminution, degree of their moistening or drying, uniformity of mixing of the components, technological parameters of the extrusion, form and diameter of matrix holes, type of auger elements and sequence of their assembly, that are necessary to increase the complex index of extrudates quality. In this case, the complex index of extrudates quality can be obtained by determinging optimum conditions, and the task of a research worker is to find this state with the desired resources vector from a set of possible states of the complex index of extrudates quality. The presence of a set of purposes for increasing the complex index of extrudates quality, the set of resources that are necessary and sufficient to achieve it, determines the problems of selection in these sets.

Results and Discussion

It should be noted that the choice of the optimum strategy to increase the complex index of extrudates quality to a large degree depends upon the subjective qualities of the research worker, and also on the initial conditions of each applied task, therefore, in general, it is not possible to make these strategies concrete, *i.e.* to propose the method of solution. But it is possible to indicate the way in which the choice can be made much easier. One of the methods for choosing the optimum strategy to increase the complex index of extrudates quality can be introduction of priorities for purposes and resources. It is known (Novoseltsev, 2006) that priorities should be formed prior to direct distribution of resources or during solution of the problem, when the obtained information about importance of one or another purpose, or about the efficiency of use of every existing resource is analysed.
Thus, the task of increasing the complex quality index is multi-purpose in nature, possesses many criteria for evaluation and alternatives for solution. This task requires a system approach, the main principles of which are the singularity of

functional-purposeful and cause-effect relationships on all the steps and phases of increasing the complex index of extrudates quality and on all the levels of its management.
The procedure for the synthesis of the system S is a complex process, connected with a large number of different problems. The end product of the process will be the optimum vector of the resources, agreed with the objectives of the task and possibilities of the objective of the investigations.
To formalise the next step of the investigations it is necessary to solve the problem of structuring the set of resources. Then the method of increasing of the complex index of the quality of extrudates can be described as a system:

CQI = < R, **RRR, d, C, E, V** CQI,R >, where R is the name of the resource that is used to increase the complex quality index of extrudates, RRR – the region of realisation of the resource.

Each resource (d) requires specific conditions for its use or realisation (C) with the objective of increasing the complex quality index of extrudates (E) by the method of realisation by the effect (E) and includes the set of the required values of the complex index of quality (CQI) of the extrudates and the set of requirements to the complex index of quality of extrudates (R), *i.e.*

CQI = {food value, structural-mechanical, functional- technological, organoleptical indices and safety indices, including microbiological ones, and microstructure of the products}.

It should be noted that each quality index of extrudates has its own special properties: division into groups, interrelationship, possibility of combination, absolute or relative values, the broadness of the list of indices, *etc.* We believe that if any two components of the system or phenomena have at least one property in common, then there is a connection between them by common nature of properties. If a specific functional relationship between different properties of two different components exists, then a connection between these components exists by mutual dependence of the properties. The connections existing between the components of the complex quality index of the extrudates are presented as a graph of the dependencies of the complex quality index components (Figure 1).

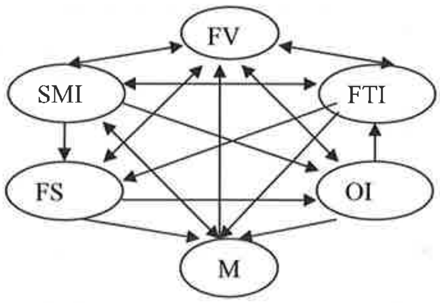

Figure 1: Graph of relationships of the extrudates quality components complex index

Conclusions
The analysis of relationships and interactions of extrudates quality complex index components, presented in Figure 1, allows us to judge the structural characteristic of the problem. This characteristic is one of the most common characteristics of the system, reflecting the set of steady relations, connections and interactions between the levels and components of the system under the conditions of external and internal effects.
In accordance with the classification of typologies of structures (Novoseltsev, 2006) as used in the system analysis, the present system problem can be related: by spacious topology - to the volumetric, having three-dimensional structure; by the nature of development – to extensive, for which the growth in the amount of links is typical; and by the kind of interactions – to the mixed, for which combination of material, energetic and informational types of structures is typical; by the nature of connection – to totally connected systems possessing high informative value.

Reference
Novoseltsev, V.I., Tarasov, B.V., Golikov V.K. and Demin B.E. (2006), Theoretical bases of system analysis. Edited by V.I.Novoseltsev – M.: Major, 592 pp.