Estimation of Quality and Competiveness of Radio-Frequency Identification Systems of Objects and Subjects on a Rail Transport

Alexander Bagdasaryan, Sergey Bagdasaryan, Valeriy Butenko, Alexey Kashenko, Gennadiy Kashenko, Roman Semenov

Abstract - **In this paper the approach for estimation of quality and competiveness of radio-frequency identification (RFID) systems on a rail transport are given.**

Keywords - **Radio-frequency identification system, Estimation of quality and competiveness.**

I. Introduction

Necessity of the decision of problems of the control, management and safety maintenance by transportation cargoes on a rail transport in the conditions of restrictions of material and time resources causes the urgency of introduction of automatic RFID systems confirmed with world practice. Definition of the best variant of RFID system is a problem on which decision expansion of a scope of these systems on a rail transport will depend in many respects.

II. Estimation of Quality and Competiveness of RFID Systems

For an estimation of quality and competitiveness of RFID systems the indicators most full characterizing system from the point of view of the person, the making decision (PMD) should be formalized. In each concrete case PMD to have to form quality indicators of considered objects taking into account the purposes of an estimation, etc. [1].

Set of indicators of quality expediently hierarchically to structure, that allows to compare, first, systems to separate group signs procedure of definition of factors of weightiness of indicators, secondly, is facilitated. Generally all set of indicators of quality and competitiveness of RFID system includes some tens the criteria grouped on species groups: constructive, functional, economic and special. Feature of RFID systems is that generally their indicators of quality and competitiveness can be the quantitative, qualitative and set intervals of the values. At comparison of various RFID systems complex indicators qualities (CIQ) and competitiveness are widely used. The chosen CIQ or system of private indicators are a basis for decision-making on preference of a variant of system from some set.

Let $X = \{x\}$ set of all RFID systems offered PMD for a quantitative estimation of their competitiveness. The basic making multicriterion models of an estimation of quality and competitiveness is vector criterion function:

Alexander Bagdasaryan – NIIR FSUE, Kazakova Str., 16, Moscow, 105064,RUSSIA,
E-mail:bas@niir.ru

$$Q(x) = (q_1(x), q_2(x), \mathbf{K}, q_m(x)) \qquad (1)$$

consisting of minimized criteria $q_i(x) \to \min$ $i = 1, 2, \mathbf{K}, m_1$, $m_1 < m$, and, probably, maximized criteria $q_i(x) \to \max$, $i = m_1 + 1, \mathbf{K}, m$.

The basic approaches to an estimation of quality and competitiveness of RFID systems consist in the following. Let one of indicators of quality $q_i(x)$ is dominating, and all the others are considered in the form of the restrictions defining area of admissible alternatives:

$$q_i(x), \qquad (2)$$

$$q_j(x) \geq q_j^{(0)}, j = 1, 2, \mathbf{K}, k \qquad (3)$$

$$q_j(x) \leq q_j^{(0)}, j = k + 1, \mathbf{K}, m, j \neq i, \qquad (4)$$

where $q^{(0)} = (q_1^{(0)}, q_2^{(0)}, \mathbf{K}, q_m^{(0)})$ - vector defining admissible values on all indicators. Then the problem of acceptance of the optimum decision is formalized as follows: to find $\max\limits_{x \in X} q_i(x)$ or $\min\limits_{x \in X} q_i(x)$, at restrictions (3) - (4).

Also quality of alternatives can be estimated by distance between ideal and considered alternatives. As ideal ("reference") the alternative to which there corresponds vector $q^{(0)} = (q_1^{(0)}, q_2^{(0)}, \mathbf{K}, q_m^{(0)})$ usually is accepted. Then:

$$Q = \sum_{i=1}^{p} (q_i^{(0)} - q_i) + \sum_{i=p+1}^{n} (q_i - q_i^{(0)}), \qquad (5)$$

where q_i - the private indicators which are subject to maximization, $i = 1, 2, \mathbf{K}, p$ and minimization, $i = p + 1, \mathbf{K}, m$,

$$Q = \max_i \left| q_i^{(0)} - q_i \right|. \qquad (6)$$

III. Conclusion

In this paper the approach based on CIQ for ranging of investigated systems is made, and administrative decisions on estimated RFID system on a rail transport are given.

References

[1] Yu.V. Gulyaev, A.S. Bagdasaryan, A.G. Kashchenko, S.A. Bagdasaryan, G.A. Kashchenko, R.V. Semyonov "Modern condition of problems of designing of radiofrequency identification systems with acoustoelectronic components," *News of Academy of engineering sciences of A.N. Prokhorov.*