INTERNAL COMBUSTION ENGINE AS AN AUTOMATION OBJECT

Mikhail Brench

Belarussian National Technical University, Belarus

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Introduction

Automation of functioning internal combustion engine systems and mechanisms (ICE) raises the efficiency of its work. Existing standards endicates the necessity of obligatory regulation of the engine thermal mode, presence of the alarm system, for the diesel engine – presence of the fuel pump governor.

Revealing of other places of automation is actual. On "Internal combustion engines" chair (BNTU) the corresponding technique is developed.

It is offered to enter into engineering practice the term “heuristopos” analysis of a technical object (Greek εὕρισχω-I find, Greek τοποξ-place).This is new word – building in technical language

Technical paper

Heuristopos analysis of a technical object assumes the revealing of structural elements of an object or processes in them use of which will allow to organize an algorithm of achieving preliminary aims (or decision of a technical problem). The report describes an example of using of the method of heuristopos analysis diesel such as the automation of an object.

The heuristopos analysis technique assumes the set sequence of actions and application of different ways to achieve the set purposes.

SEQUENCE OF ACTIONS FOR ENGINE HEURISTOPOS ANALYSIS

1. Choosing an analysis object (an engine, a mechanism, a functional system, a working process). Statement of the problem.

2. Object functional purpose.

3. Composing an information model of the object.

4. Aim of the research.

5. Functional model of the object.

6. Main and auxiliary bundles.

7. Choosing the method of finding a search place.

8. Revealing ACS parameters.

9. Technical solution registration.

STAGE 1. Choosing an analysis object. Statement of the problem.

Analysis object – central piston-connecting rod-crank mechanism (RCM).

Statement of the problem – to reveal in piston ICA the bundle, which allows to change a piston stroke for managing the engine working volume during its work.

STAGE 2. Object functional purpose.

PRCM represents a functional bundle of the piston ICE – the final converter which purpose is in transformation of working body thermal energy (gas) into mechanical energy. Algorithm of PRCM functioning – transformation piston movement into rotary motion of the crankshaft.

STAGE 3. Composing an information model of the object.

Any technical object is characterized by the number of parameters which are defined by a design and algorithm of the object functioning. In general it is represented by the information about the object condition. Constructive RCM scheme with the forces designation which influences on its details, kinematics and dynamics equations will define information RCM model.

STAGE 4. Aim of the research.

To reveal a constructive element which will allow to change a piston stroke with a rotating crankshaft.

STAGE 5. Functional model of the object.

F1 function – a constructive element perceives gas pressure and transforms it into gas force.

F2 function – a constructive element transfers the force to a shaft.

F3 function – a constructive element transforms the force into a torque.

In this RCM scheme F1 function is implemented by the piston surface, F2 function – connecting rod, F3 function – crank of shaft.

STAGE 6. Main and auxiliary bundles.

All the elements are main.

STAGE 7. Choosing the method of finding a search place.

We use the method of morphological synthesis of technical solutions.

We make the morphological table (function Fi / constructive solution Aik).

The final converter includes functions: F1 + F2 + F3.

The constructive solutions choices of the Fi function are independent from each other.

The number of possible variants of technical decisions: 4*5*6=120

Searching of possible technical solutions and rejection of technically impossible solutions gives 8 variants of technical solution of the final converter:

1. Piston surface – connecting rod-crank (prototype).

2. Piston surface - connecting rod – eccentric shaft.

3. Piston surface – connecting rod – double eccentric shaft.

4. Piston surface – liquid – hydromotor.

5. Liquid surface – liquid – hydromotor.

6. Rotor surface – rotor – eccentric shaft (RE).

7. Shovel surface – shovel on a shaft – mechanism of torque summation.

8. Shovel surface – shovel on a turbine wheel – the shaft of the turbine wheel (GTE).

The technical solution according to the scheme №3 satisfies the conditions of the problem (stage 1).

STAGE 8. Revealing ACS parameters.

In the chosen constructive solution the variable radius of a crank organized by two eccentrics is the operated parameter.

STAGE 9. Technical solution registration. We patented this technical solution. Patent USSR 985492 F 16 C 3 / 28 Movement of double eccentric shafts is operated by hudraulic control system.

Conclusions

The heuristopos analysis of the technical object represents a creative task when the result of the decision, as a rule, is multiple-valued. The sample of problem solution is absent. Searching of the necessary communications or constructive elements in a technical object generates the creative side of the design engineer. Working on the such quality will allow the designer to choose the most effective variants of technical object realization and working processes in it.