Ақтөбе обылысына жатады. Бұл обылыста 20-ға жуық мұнай және газ елді мекендер, сондай-ақ тұзүсті және тұзасты шөгінділері бар. Айта кететін болсақ, Жаңажол, Кеңқияқ, Әлібекмола, Қожасай-Ұрықтау, Шығыс Ақжар, Солтүстік Трува сияқты кен орындарда тұзасты шөгінділерінен мұнай табылған. Ал әдетте, табылған және расталған мұнай қорлары тұзүсті шөгінділерінен алынады, бұл көрініс орта және кіші мұнай кенорындарына тән. Барлау тарихының ерекшеліктеріне байланысты, тұзасты облысының зерттеу деңгейі біркелкі емес болып табылады.

Кілт сөздер: геологиялық, геофизикалық, қайта бағалау, мұнай және газ, жылу әдістері, мұнай бергәштәк, кенорын, бассейн, Ақтөбе аумағы, тұзасты, тұзүсті, шөгінді, сейсмикалық әдңс, бұрғылау, Каспий аумаға, көмірсутегі.

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SCIENTIFIC TECHNICAL SOLUTION UPON FAST ACTING AUTOMATICALLY LOAD BACKUP OF ELECTRICAL SUPPLY

Abstract

There is given the mainly reasons violation of reliability electric power supply of principal consumers are the short circuits in diagrams of external and internal of electric power supply. We provided the need of using algorithms which makes it possible to identify emergency situations in correct way.

Key words: electrical supply system, automatic load transfer, voltage depression, dynamical stability, electrical services.

Introduction

In that situation the solution of reliability electric power supply problems are lay on consumers of electricity. Especially the last true for solution own tasks industrial companies with complex technological of processes. And also industrial companies that widely uses the tools of automatics. Among them specializing in the extraction and processing of oil and gas, metallurgical, main railway electrified transport systems, water utilities, wastewater and others.

The short circuit have a hold over these enterprises as for work a high voltage electric motors, low voltage electric motors of various electric device control elements of electrical systems and devices of managements of electric technical process. The finally happened ten times per year and leads to a signification of economical damage. Even if there are duration is several hundred milliseconds.

Main part

Traditionally in electricity grids for struggle breaks of electric power supply uses the device of automatically turning ABP (Automatic backup (transfer) power). As starting in this devices typically uses of the minimally voltage elements.

Despite there is need to get the power supply for electricity consumers as fast as possible, it is required to introduce a deliberate slowing action of an automatic load transfer trigger. The referred above is produced to prevent the excessive action of ALT trigger. Such actions occur at SG in adjacent parts of a network and at the action of AR devices feeding lines.

Thus, it is required to produce a deceleration time longer than the maximum delay of RP in adjacent areas of the network, or more time than the time delay of AR devices.

As a result of the time delay of the ALT device action may be reached for several seconds.

This amount of time delays of ALT actions is unacceptable. In the task formulation of the continuity preserving of industrial enterprises complex processes, for instance: synchronous

motors loss synchronism; rollover of induction motor; turning off contactors; turning off 380V starters; turning off frequency - regulated drive units of electric pumps of other critical load.

More technically advanced than the traditional ALT unit has been developed. That device is designed to prevent damages and ensure the continuity of technological processes of industrial enterprises. It is characterized by excess speed - high-speed ALT (HALT) devices. Traditional high-speed ALT is based on the multi-channel algorithms, which define disruption of power supply according to one of the inputs. Since different types of disorders significantly affect the various parameters of power supply system mode [1].

To control these parameters in the starting device of HALT, it is stored a significant number of installations such as:

At minimum current at the input I_{device},

At minimum voltage on the sections U_{device},

At minimum voltage of phase on the adjacent sections δ12devices, and several others. Checking which in some cases leads to the increase of the total cycle time HALT. A single-channel algorithm for determining power disturbance is deprived of these drawbacks. In this connection, a new generation of HALT has been developed with improved transient response performance [2, 3, 4].

The trigger of HALT works on a new algorithm, which works to identify a violation of the normal power supply. It can be implemented in two ways.

The first method is based on determining the sign of the following special powers in the phases of inputs to the sections of SG (switching gear):

$$\begin{aligned} T_a &= \mathrm{Re}\,(U_{bc}I_a e^{-j\varphi}) \\ T_b &= \mathrm{Re}\,(U_{ac}I_b e^{-j\varphi}) \\ T_c &= \mathrm{Re}\,(U_{ac}I_c e^{-j\varphi}) \end{aligned} \qquad (1)$$

That provides a product of vectors of line voltages be vector of opposite phase current in a view of the angle of maximum sensitivity (δ_{ov}).

Powers Ta, b, c are a linear combinations of active (P) and reactive (Q) powers in these phases.

Due to the angle of maximum sensitivity (φ_{ov}), it can be changed a share of representation of these powers in the linear combinations.

Optimum value of angle is a nearly by ($\varphi_{ov} = 45^{\circ}$). A positive value of power corresponds to direction from the source to the load. A negative value is from the load to the source.

A working of this starting device high speed ABP at various kinds of violations of the normal power is on the first section (SG) (figure 1). In the case of short circuit in the power supply circuit (points of short circuit K1, K5). In the case closely to the external short circuit (points K3 K2).

In these cases happen a changing of direction of powers Ta, b, c though prefatory switch BB1.In the case of threephase short circuit a changing happens in all three phases. In the case of interphase short circuit in two phases. In the case of a single phase short circuit in one phase. Changing the direction of power at least in one phase inures a signal for trigger high speed ABP. In the case in electrical circuit of the switch BB1(points K3 K3,K4) changing the directions of power through BB1 is not happened and high speed ABP is close.

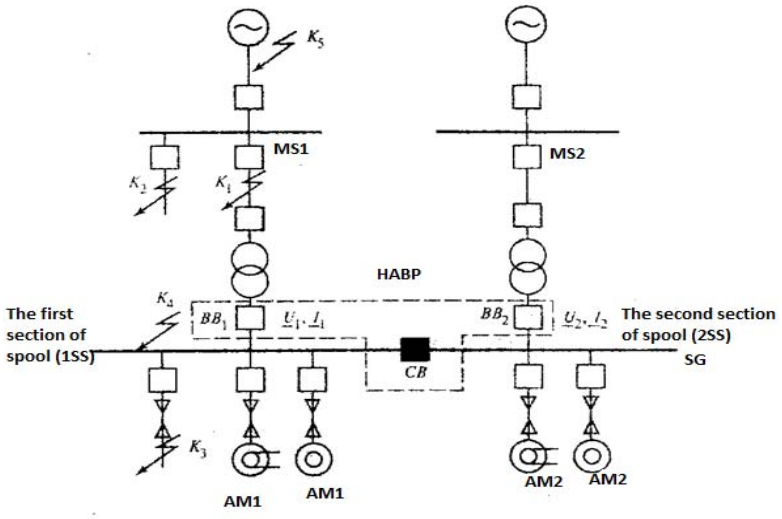

Figure1. Schematic drawing of electrical supply of an industrial plant with high speed ABP device.

To improve the reliability of the device must be built up from the cases such as: when Ia = Ib = Ic = 0 or when Uab Ubc Uca or equal to zero, also when the sign of power Ta.Tb.Tc become uncertain. For this we first compared.

To improve the reliability of operation is necessary to avoid the cases when Ia = Ib = Ic =0. Also, when Uab or Ubc or Uca equals zero and the sign of power Ta, Tb, Tc becomes uncertain. For this we first compared.

$$I_a \text{ и } I_b \text{ и } I_c < I_{set}, \quad (2)$$

Where, I_{set} is a set point minimum current. If this condition is met, then an unauthorized circuit breaker in the power circuit. It is necessary to switch to a backup power source. In particular, when the switch is turned off BB1 (Figure 1) so Ic <Iset and HABP work.

If you turn off the circuit breaker MS1(mean switches), HABP is activated due to changes in the direction of power Ta, b, c., when electric motor is powered by load (СД1, АД1) in running-out. And if the power of the electric motor load is not enough, then by the data Ic <Iset.

If at least one of the linear voltages on the section is zero, the condition is tested.

$$Uab \text{ or } Ubc \text{ or } Uca < U_{set}, \quad (3)$$

Where U_{set} – set point minimum voltage. Then for the corresponding line voltage applied line voltages of the backup section. For example, if Uca < U_{set} then Uca = U_{sec}. In particular, line voltage on the first section equals zero at the three-phase short-circuit at K4 (Figure 1). As their values are accepted line voltages of the second section.

Thus, the method of automatic backup power supply switching, based on a change in the direction of special facilities in phases (1). Taking into account the boundary conditions (2) and (3) it allows to realize a single-channel control principle HABP. And thereby it increases the speed of response to violation of the normal power supply. The circuit diagram of the proposed automatic backup switching of consumers' power is depicted in (Figure 2). The apparatus comprises: primary (1) and backup (2) power source; main switch of operation input (3) and (4); section switch (5);bus sections of substation (6) and (7); three-phase current transformers (8), (9) on the inputs of the main and backup power supplies; voltage transformers (10), (11) on the tires of primary and backup power supplies; microprocessor-speed triggers (12); microprocessor-speed trigger (12)

comprises: blocks forming phase vectors (13), (14); line voltage (15), (16) of direct sequence; blocks (17) and (18) checks the value of the currents phase to meet the minimum value (I_{set}); blocks of the minimum values determining of line voltages on the sections of the main and backup power sources (19) and (20); blocks of power direction determining on the input phases of the main and emergency sources (21) and (22); logic elements "AND" - 23, 24, 25, 26, 27, 28, 29, 30, 31, 32; logic elements "OR" - 33, 34, 35, 36; the control switches units 37; signal relay protection and automation blocks 38 and 39.

The inputs of the current transformers (8), (9) are connected to the input blocks (17), (18) and (21), (22). Inputs of voltage transformer windings (10), (11). United in a star on the sections of main bus (6) and backup (7) power sources. Connections are provided respectively to the inputs of the blocks (19), (20) and (21), (22). The outputs of the blocks (17) and (18) are connected to the logic elements "AND" (23) and (24). The outputs of the blocks (21) and (22) are connected to the logic elements "AND" (25, 26, 27, 28, 29, 30). The outputs of that are connected to the logic element "OR" (33), (34).

The outputs of elements (23) and (33) and respectively the elements (24) and (34) are connected to inputs of logical elements "OR" (35) and (36). The outputs of which together with blocking signals (38) and (39) are connected to the invert output which are connected to the logic elements "AND" (31) and (32). The outputs of the latter are connected to the control switches unit (37).

The device operates as follows. The complex values on the first line voltages (U1ab, U1bc, U1ca) and second (U2ab, U2bc, U2ca) mutually redundant power sections of the switchgear are measured by the voltage transformers (10), (11) and (15), (16) blocks. The complex values of the phase currents (I1ab, I1bc, I1ca) on the first and the second (I2ab, I2bc, I2ca) inputs are measured by the current transformers (8), (9) and blocks (13), (14).

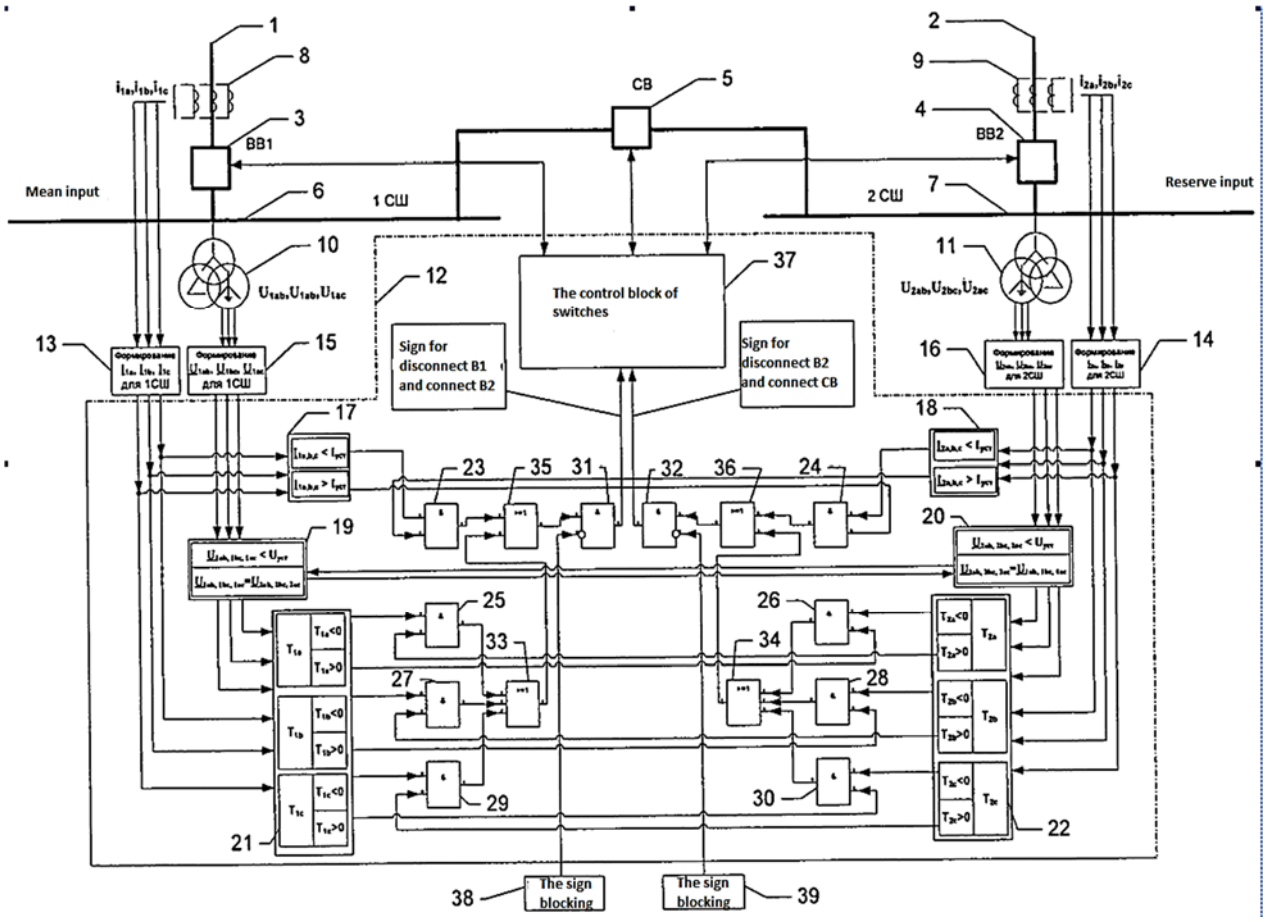

Figure 2. Structure schema of ABP with the single canals principle works

The algorithm of device work HABP is following: if the powers (signals blocks direction of voltage power 21 and 22) on the input from the main source in at least one phase of the changed sign to negative, powers on the input at backup source all over the phases positive. Then through the logical elements 23, 25, 31 (or 24, 36, 32) in control unit switch 37 receives a signal on switch of first 3 (the second 4) input and on the turning of section switch 5.

For improving reliability works of device has been suggested to rebuilt from the cases, when $I_a = I_b = I_c = 0$, and when U_{ab} or U_{bc} or U_{ca} equal the zero and the signal of powers T_{1a}, T_{1b}, T_{1c} to become undefined.

For this preliminary comparisons compare I_a, I_b, I_c ‹ I_{found} where I_{found} – adjusting minimum current, and if that condition be going on, unauthorized disconnection of switching in the chain supply circuit and necessity shifting of the electric supply power to the backup source. If $[U_{ab}]$ or $[U_{bc}]$ or $[U_{ca}] \leq U_{found}$, where U_{found} – minimal voltage. As significantly liner voltages takes of liner voltages reserve section.

In that ways the device of automatically turning of backup electric supply power customers released on the single channel principle. Which can help of determining damage of normal electric supply power at meanly source for changing sign of powers in inputs fazes.

The second way of single-channel definition of the fact of violation of normal power supply is based on definition of a sign of special capacities of direct sequence on inputs to sections SG.

$$T_p = \mathrm{Re}[U_P I_P e^{\varphi_{ov}}] \quad (4)$$

Where U_p – vector of tension of direct sequence on sections SG; I_p – the interfaced vector of current of direct sequence on inputs to sections SG.

Capacities of T_p represents a linear combination of active (RP) and jet (QP) of capacities of direct sequence on inputs to SG. In particular in the symmetric modes

$$T_p = P_p \sin\varphi_{ov} + Q_P \cos\varphi_{ov} \quad (5)$$

At the expense of a corner of the maximum sensitivity φ it is possible to change a share. A share of representation of these capacities in linear combinations. At positive value power has the direction from a source to loading. And at negative value – from loading to a source.

Functioning of algorithm is provided. The basic on Tp power sign in boundary cases. When current of Ip =0 or tension Up=0 and a sign of expression (4) becomes uncertain. Comparison is for this purpose made

$$I_P < I_{set} \quad (6)$$

And if this condition is satisfied, switching of power on a reserve source is necessary. If U_p tension on one of phases of sections SG closely to zero value, i.e.

$$U_P < U_{set} \quad (7)$$

That U_p value is accepted by the equal

$$U_P = U_{P\,res.sec} \quad (8)$$

We will consider operation of the HABP starting arrangement on the second way. After measurements and calculations of linear tension on sections (Uab, Ubc, Uca) make calculation of tension of direct sequence of UP. Similarly on values of phase currents (Ia Ib Ic) of direct sequence of UP on inputs to sections SG. If the condition (6) is satisfied, there is an operation of HABP. Otherwise according to (4) TP power is defined. If the sign at this power positive on HABP remains closed. And if negative, HABP works.

Thus, the way of atomic inclusion of reserve power supply based on change of the direction. Special power of direct sequence on inputs of SG. Also allows to realize the single-channel principle of management of HABP [5].

In compliance with the schematic diagram of HABP (Figure 2) prototypes of the microprocessor starting device are developed. For further ex-remental researches.

Findings of investigation

Advantages of the developed БАВР microprocessor the starting arrangement consists in the following:

1. The HABP starting device is based on digital systems of processing of values of entrance signals.
2. Lung HABP (at the program level) adapts for various schemes of the distributing device.
3. Switching time for a reserve source is reduced. At three-phase KZ and a power-supply circuit of section of the distributing device to 22 - 44 ms (for example, when using VW1 switches - T ABB CalorEmag or BB/NELLShell firms).
4. Has possibility of record and display of transition processes at any operation PU HABP.
5. Values of installations of blocks of the relay of the starting arrangement in non-volatile memory remain. At removal of tension of expeditious power.
6. There is a possibility of automatic return of the scheme of the normal mode of power supply on the damaged input.
7. For management of inclusion and shutdown of switches in PU HABP besides dry contacts it is offered to use high-speed IGBT. IGBT - the transistors capable to switch currents of great values.

Conclusion

High-Performance Reserve Switching Device (RSD) contains a set of starting elements, which interact with each other in accordance with above mentioned algorithms; they allow correctly identify emergency mode, where input of the backup powering station is necessary (in a power system), and the switch to the backup powering station is not required (in collecting bus-bars of the indoor switchgear);

Starting elements of High-Performance RSD allow resolvedenoted tasks for the minimum period of time, not requiring the time harmonisation with relay equipment and automatics of adjacent network elements.

Use of the proposed algorithm in launching set of High-Performance RSD control allows time for the emergency response appeared between 5 and 12 ms (depending on the type of failure). Full cycle of switch to the backup power will amount in 27-34 ms in the combination with ultraspeed vacuum circuit breaker BB/TELL of the“Q” series. Given time indicators of the full cycle of High-Performance RSD are tested by thousands of accomplished projects around the world, including Russian Federation and Kazakhstan.

The introduction of the High-Performance RSD complex will present the following results:

- It will provide safe and continuous power supply of main pipelines, electrifying railroads, industries of continuous technologies and etc. by providing daily schedules made by the full-time switch to the backup power for the time of 0,034 sec.
- Considerably increase electric motor and pumps resource due to lack of necessity of repeating launch of aggregates as well as oil preheaters by reducing the possible overheating.
- Reduce of energy consumption by reducing losses inrestarting and restoring general flow rate of the pipelines filled up to 200 km. Reduce of losses of preheating furnace after blowing.
- Prevent costly breaks of work of technology equipment; reduce risks of environmental disasters in failure of power system.
- Increase of the level of automation. Increase of productivity.

High-Performance RSD industrial models conducted are based on the proposed algorithm of the operation of single-canal device, made by the creative team consisted of the members of the Department of Industrial Power MEI (Moscow), the Department of Power of Kazakh Academy of Transport and Communications named after M. Tynyshpayev (Almaty) and LLP “NPK Promir”.

Installation and testing of the models were conducted in 2013 at JSC “Ozenmunaigaz” in CRUN – 6 kV for PS 110/6 UPSV – «Vpadina».The time of switch to the backup power – 0,032 sec. was identified during the process of natural load testing. Given time allowed save 100% consumer load among which high-voltage motor STD – 1250 BKNS.High-voltage and low-voltage motors initial water (removal unit), electric tools - rocking (SKN) oil wells were found.

It is also in the process of setting up a block HABP revealed unstable single phase fault in the network on ground. The subsequent discovery in the motor UPSV, which will reduce the impact and cost of repairs [6].

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Ерболатқызы Г., Садықбек Т.А.

ЭЛЕКТР ЖЕЛІСІНДЕГІ ҚОРДЫҢ АВТОМАТТЫ ЖЫЛДАМ ӘСЕР ЕТУДЕГІ ҒЫЛЫМИ – ТЕХНИКАЛЫҚ ШЕШІМДЕРІ

Аңдатпа

Мақалада көрсетілген жауапты тұтынушылардың сыртқы және ішкі сұлбалардағы электр жабдықтарының қысқа тұйықталуының (ҚТ) себебі бағалау анализінде көрсетілді. Алгоритмнің қолдану қажеттілігі төтенше жағдайлар арқылы айқындалып, дәлелденді.

Кілт сөздер: автоматты қорды іске қосу, кернеудің құлауы, динамикалық тұрақтылық (орнықтылық), электрмен жабдықтау жүйесі, электрлік жүйелер.

Ербулатқызы Г., Садыкбек Т.А.

НАУЧНО – ТЕХНИЧЕСКИЕ РЕШЕНИЯ ПО БЫСТРОДЕЙСТВУЮЩЕМУ АВТОМАТИЧЕСКОМУ ВВОДУ РЕЗЕРВА ЭЛЕКТРОПИТАНИЯ

Аннотация

В статье проведен оценочный анализ причин нарушения, надежности электроснабжения ответственных потребителей являются короткие замыкания (КЗ) в схемах внешнего и внутреннего электроснабжения. Выявлена и обоснована необходимость использования алгоритмов, позволяющие правильным образом идентифицировать аварийные условия.

Ключевые слова: автоматический ввод резерва, провал напряжения, динамическая устойчивость, система электроснабжения, электрические сети.

УДК 631.171(075.8)

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МЕТОД И ПРОГРАММА ДЛЯ ОБНАРУЖЕНИЯ ТРЕЩИН СКОРЛУПЫ ПО ИЗОБРАЖЕНИЮ ЯЙЦА

Аннотация

В статье описывается алгоритм и возможности компьютерной программы для обнаружения трещин скорлупы яиц с помощью системы технического зрения. Программа разработана в среде LabVIEW. Приведены результаты виртуальной проверки эффективности программы для обнаружения трещин скорлупы.

Ключевые слова: скорлупа, трещина, программа, яйцо, labview, vision assistant, holes, виртуальный прибор.

Введение

Скорлупа – основная составляющая часть яйца, определяющая его цельность и обеспечивающая защиту от воздействия внешней среды. Скорлупа представляет собой особый двусторонний фильтр, регулирующий поступление газов и влаги внутрь и выделения продуктов обмена наружу. Поверхность скорлупы у нормальных яиц гладкая, блестящая, одинакового цвета. К дефектам скорлупы относятся: наличие трещин, мраморность, морщинистость, повышенная пористость, шероховатость, наличие известковых утолщений и другие отклонения. Наряду с биологическими факторами на целостность скорлупы существенное влияние оказывает и технологические факторы, обусловленные взаимодействием яиц с технологическим оборудованием и между собой, в результате которых нарушается целостность скорлупы, образуются трещины, загрязнение и тек. Нарушение целостности и дефекты скорлупы существенно снижает инкубационные и потребительские показатели яиц. Нарушение целостности скорлупы инкубационных яиц приводить к снижению выводимости более чем в два раза, до 37%, при норме 89-92% [1]. Согласно требованиям к качеству пищевых яиц, в зависимости от степени повреждения различают: яйца с поврежденной скорлупой (насечка, мятый бок, трещина) и «тёк» - яйца с частичной вытечкой содержимого при условии сохранения желтка. Яйца с поврежденной скорлупой относятся к пищевым отходам. Качество скорлупы характеризуется следующими показателями: прочность, толщина, относительная масса, упругая деформация, плотность яйца. Все они тесно связаны между собой высокими коэффициентами корреляции. Так, прочность скорлупы положительно коррелирует с