Dehradatsyonnыy refusal, reliability of forecasting, stohastycheskaya model.

General approach to the decision of problem of construction of the inverted models of mechanical reliability in the case of degradation refusals is considered. The offered methods are illustrated by the real example of prognostication of longevity at the wear.

***Degradation refusals,** reliability of forecasting, stochastic model.*

UDC 631.1

DEVELOPMENT METHODS QUALITY threaded connections GRAIN seeders

VD Voytyuk, VI Rublev, PhD
VG Opalko, applicant

In the article the method of assessing the quality of performance of threaded connections grain seeders type SZ-3,6A and presents the results of research.

Grain drills, screw connections, regulations, quality.

Formulation of the problem. The main focus is agriculture of Ukraine grain production, the stability of which depends largely on the support. One of the key parts of increasing the yield of grain crops, return on investments of labor and means of equipping households are modern high performance machines for sowing in accordance with the requirements of cultural practices. High-quality farm equipment including drills and provide a high level of development of agriculture of Ukraine in the current market conditions.

Analysis of recent research. Quality is one of the determining factors of competitiveness of agricultural machinery. In the open market of products of domestic agricultural engineering proved uncompetitive. It was established [3], including indicators such as price, delivery, service, quality determines 70% solution of choice products. As a result, the share of domestic equipment in the amount of its implementation has decreased in the last three years is less than 30% [1]. Therefore, Ukraine's economy annually loses 4-6 billion. UAH that agricultural producers invest in the purchase of imported technology [2].

Analysis of research mashynovyprobuvalnyh stations [4] shows that 95-97% of cars produced samples with deviation from the

specifications, 80-85% - did not meet safety and ergonomics, every fourth sample has a lower coefficient of readiness requirements specifications for production. Made technique has low reliability and remontozdatnosti. Up to 60% of failures occur due to machine manufacturing defects (defects mostly through cleaning machines), and their removal is from 2 to 30 days.

To improve the technical level of agricultural machinery must proceed from the fact that the quality of equipment based on its current unified element base and component construction machines.

Threaded connections are widely used in engineering, and is one of the most common ways to connect folding machine parts. In the construction of modern machines, their share is 30-40% of the total number of connections, and in some machines and devices - up to 80% [5].

Share threaded connections used in modern combine harvesters, is 1% by weight or 1.1-1.8% of the combine. It's revealed that 15-25% of refusals combine harvesters first year of operation failures occur due to threaded joints [6].

The most popular in the Ukrainian market today are sowing PJSC "Red Star". A systematic analysis of the type of seed drill SZ-3,6A indicates that this seeding machine includes a large range of components. However, many components at different levels of complexity with threaded connections.

The use of large quantities of threaded connections in modern agricultural machines demonstrates the relevance of their selection as a separate item and study their impact on the quality of equipment.

Investigation of process parameters tightening threaded joints subject of many domestic and foreign publications, but they have not considered the impact of the parameters of threaded fasteners on the build quality of the finished product and its use.

The purpose of research: Definition of algorithm methodology for assessing the quality of threaded connections grain seeders type SZ-3,6A; research impact indicators threaded connections on the technical level of sowing machines; assessment of the threaded joints and their elements normalized requirements in the manufacture and further operation

Results. Study of regulatory documents and sources that are devoted to the subject of work performed in accordance with GOST 3575-97. [12] As a result, formulated the general requirements for bolts, screws, studs and nuts:

1. The standard bolts, screws, studs and nuts in accordance with ISO ISO 8992: 2006 [25] characterized by: mechanical properties

(material); accuracy (tolerances); cover surface (if necessary); special requirements (if applicable).

2. Appearance standard bolts, screw pins and nuts in accordance with GOST 1759.0-87 [7] must meet the following requirements: surface bolts pytov, studs and nuts should be clean, with no trace of corrosion and mechanical damage; allowable surface defects bolts, screws and studs - GOST 1759.2-82 [8]; allowable surface defects nuts - GOST 1759.3-83 [9].

3. Mechanical properties of materials manufacturing bolts, screws and pins should meet the requirements of GOST 1759.4-87, GOST ISO 898-1: 2003 [10, 18]; nuts - GOST 1759.5-87, GOST ISO 898-2: 2004, ISO ISO 898-6: 2003 [11, 19, 20].

Based on the general requirements for the elements of threaded connections was determined range of normalized indicators for:

- bolt:

- Cheap responsibility - IV class - malovidpovidalni connection according to OST 37.001.031-72 [26];
- accuracy class A, B;
- class strength bolts for d <39 mm 4.8, 5.6, 5.8 in accordance with ISO ISO 4016: 2007 [22];
- dimensions according GOST ISO 4014-2001, GOST 7798: 2008, GOST 7805: 2008 [16, 17, 21].

- nuts:

- Cheap responsibility - IV class - malovidpovidalni connection according to OST 37.001.031-72;
- accuracy class A, B;
- strength class is determined by the strength class of the bolt, which connects the nut GOST 1759.5-87, GOST ISO 898-2: 2004 [11, 19];
- dimensions according GOST ISO 4033-2002 State Standard ISO 4032-2002, GOST 5915: 2008, GOST 5927: 2008 [14, 15, 23, 24].

Individually determined performance threaded joints in the assembly.

1. Availability of necessary parts in the assembly joints.
2. Head bolts and nuts as should be the same height and size of turnkey properly located on the center trim.
3. Speakers rod end bolt beyond the nuts should be no more than 1-5 pitch or less than 1.5 diameter of the thread under the GATS 3-37-5-94 [12], each of the ends must be the same size chamfer.
4. The outer diameter washers and their thickness must be the same on all bolts.
5. Lock nuts should also be the same size and turnkey meet the basic nuts.

6. Head fit bolts, nuts, washers for parts to be fastened (wall box drills) should be dense. Gapping is a result of weak zatysnennya.

7. Fastening torque of threaded connections with control measurements should be in the range of 1.05 to 0.88.$М_{кр}\,max$ $М_{кр}\,min$

There were certain kinds of works and their sequence in accordance with the requirements.

1. Quality control assembly threaded connections and external examination conducted by means of measurements.

2. Measuring performance rod bolts beyond nuts.

3. Check snug fit head bolts, nuts, washers for parts to be fastened.

3.1. Perform light prostukivaniem steel hammer near the location of bolting or bolt head. With tight connection prostukivaniem must be accompanied by "thick" bell metal without vibration when you touch the other end of the hand. Sound like a rattle, indicates puff bad parts.

3.2. Perform a measurement using a set of flat probes on a "pass - not pass." For this gap inserted one by one plate of a set of probes until one of the plates will not be included in the gap.

3. Control tightening bolt connections

3.1. Mark the line bolting position available.

3.2. Release bolt connection. Threaded part of fastening elements must be clean, dry and not contaminated if no instructions.

3.3. Check calibration key and make sure that it is suitable for work. Accuracy key moment should be less than indicated in the table OST 37.001.031-72.

3.4. Tighten the fasteners to the former position marked with a dash. Pulling should be done gradually, without stopping.

It was determined instrumental support work including: calipers, standard measuring hammer or piece of wood for prostukivaniem set flat probes, torque key.

Protocols were developed forms for processing test results.

1. Form protocol for determining the density fit fasteners, components of the drill.

ID systems and components sowing	Designation interface	Names coupled components	The gap, mm
		nut-washer washer-Drill Drill-Drill Drill-head bolt	

2. Form protocol measurements of bolted joints seeders.

ID systems	Name systems and	number of bolts

and components sowing	their components									
	System Part of Bolts connection: d / ΔL									

Systematics processing results of the study carried out using statistical methods. When working with samples calculated their numerical parameters characterizing trends, variation and variation data. Data processing was performed using the program "Descriptive Statistics" package Microsoft Excel. allowing only receive statistical report on all properties. A systematic analysis of the type of seed drill SZ-3,6A shows that at different levels of complexity of its components have threaded connection. The main fastener is threaded joints bolts, screws, studs and nuts. According to calculations carried out by the total number of fasteners sowing is 1,265 pieces. Studies have shown planters on the most used are bolted connection M8, M10, M12, respectively of 24, 25 and 31% of the total. In addition, the machines used sowing bolted connection M6 and M16, they are smaller and are 13 and 6%.

3. Form protocol determining torque bolts.

ID systems and components sowing	Designation interface	THREAD Nominal diameter, mm	strength class	Actual torque, Nm	Maximum torque, Nm	Difference
	1 2 3					

Strength class of bolts to release planters for 2008 is 4.8, the planters release 2012 class strength is increased and 8.8 (Fig. 1).

On the SI-3.6 planters, made in 1998-2005. Recorded 75% korodovanyh bolts, nuts and washers.

Fig. 1. Strength class bolts planters in 2013 year.

Fig. 2. Lack of bolting, nuts on cereal box.

Most attention was given to the threaded connections according to the normalized collection requirements. Research has shown washers in bolted joints with different outer diameter and different thickness, sometimes completely absent (Fig. 2, Fig. 3), is especially characteristic for drills used for 5 years or more. The reason is lack of appropriate size washers in farms and replacing them with used or available in other sizes. Recorded cases of a coulter attachment mechanisms kontrhayok that did not meet basic size nuts.

Research threaded connections compliance system volume normalized grain seeders requirements for admission to the external length of the bolt indicate that the probability of the normalized speech sowing 1990 production varies 11,11-85.71% drill production in 2008 - within 10,53-33,33 for sowing 2012 production - within 66,67-100,00 (Fig. 4, Fig. 5).

Fig. 3. locknuts size does not fit the basic nuts.

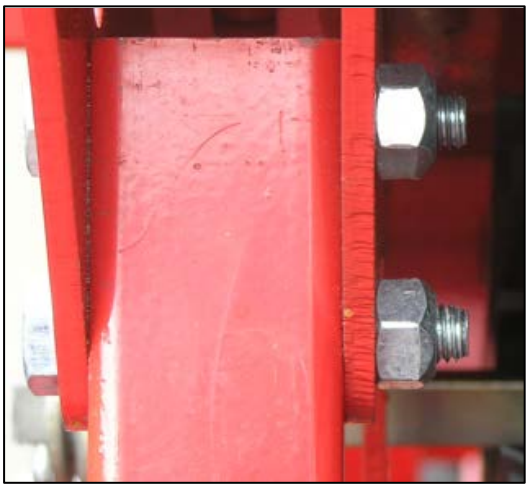

Fig. 4. Exit rod bolt nuts outside (corresponding normalized requirements).

Fig. 5. Exit rod bolt nuts outside (does not meet the requirements normalized).

Fig. 6. Reducing bolting.

Research has found gapping walls seed boxes, due to weak or uneven zatysnennyam group screwing threaded connections. It should be noted that most of the sowing machine is stored outdoors, leading to rust as between the parts of the machine, and between parts and elements of threaded connections. The result is the emergence of the gap and easing tightening (Fig. 6).

Previous efforts to tighten the requirements defined connection. Normalized delay threaded joints - is the key to reliable and safe operation of drills. In domestic practice is most often used to delay by applying fasteners required tightening torque. To determine the torque used industry standards. Depending on the degree of responsibility, strength and size of threaded joints determined by the corresponding value of the maximum and minimum torque, the amount of control.

Analysis of the instructions for use such drills SZ-3,6A has shown that they are not regulated by the value of tightening torque. Therefore, the value of torque respectively OST 37.001.050-73 [27] vary widely from 23 to 54 Nm for M12 bolt connections, nm 13-31 - for M10. Tightening control shows that only 15% of bolted connections M10 meet these requirements, 27% - it is impossible to unscrew due to corrosion, the mutual penetration of materials bolt and nut in the area under THREAD long loads. The technical level of grain seeders largely determined by the quality of parts that make up the threaded connection. Reliable Fasteners modern designs - a prerequisite of development and production of high quality planting techniques.

Conclusions

The technique makes it possible to explore and study the influence of parameters of threaded connections on the quality of grain seeders and eliminate potential weaknesses in the manufacture and further

operation of machines. The analysis of regulations formulated general quality requirements threaded connections, according to which the normalized range defined parameters. Designed for work to determine its performance and provide documentation tool and can improve the technical level of sowing machines.

Studies developed technique revealed that fittings such drills SZ-3,6A not meet the requirements, including fixed korodovani fasteners, various parameters of the elements in a single connection, access to the outer length of bolt torque value exceeded the normative values .

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In the articles presented method otsenki quality indicators rezbovыh compounds seyalok grain type SZ-3,6A pryvedenы and results of research.

Cereal seyalky, rezbovыe compounds, normatyvnыe Documents, quality.

The paper presents a methodology for assessing the quality indicators of threaded connections of grain drills type SZ-3,6A and the results of research.

Grain drills, threaded connections, regulatory documents, quality.