

## ISO QUALITY MANAGEMENT SYSTEM FOR FEED MILLS

## ISO SUSTAV ODRŽAVANJA KAKVOĆE U TVORNICAMA STOČNE HRANE

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### SUMMARY

The elaboration, installation and certification of the ISO quality - management system take time and costs, but these activities improve the effectiveness of the internal management and they are contributions to stabilisation of the market and improvement of the competitiveness of the feed mill.

The documentation by the company quality manual, procedure and working instructions are the basis of the quality system and that takes a great deal of time. The IFF model manual has supported these activities in many feed mills.

As the result of confidential relationship with the suppliers, the feed mill should be able to use quality relevant specified materials only with the proof of the specification by the supplier.

Manufacturing and control orders, certificated operating accuracy of the production plants and the effective hygiene regime are essential components of the quality - management system of the feed mill. The fulfilment of the requirements needs qualified personnel and innovative equipment.

Audits ensure the effective application of the installed system and its adaptation to changed conditions. The certifications realised up to now demonstrate the quality ability of feed mills according to the international standard.

### 1. INTRODUCTION

By means of introduction and certification of a quality - management system according to ISO 9000 et seq. (1), the efforts of the compound - feed industry for reliable products of high quality will be continued. The essential points are the improvement of the effectiveness of the company management, the proof of well - arranged

operational procedures for all quality relevant activities in the company and the independent certification of the quality ability of the feed mill. Quality ability means assurance of the product quality by process quality or reliable product quality is always the result of the total company quality.

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The ISO - standard is independent of the industrial branches and it is difficult to understand for the people in feed mills. In order to take into consideration the special problems and possible solutions of the quality management in feed mills and to support the activities for documentation of the quality - management system according to the ISO standard, the IFF (Forschungsinstitut Futtermitteltechnik) - Research Institute of Feed Technology has carried out training courses, elaborated a model manual special for feed mills (2) and it has a well - developed co - operation with feed mills as consultant in this matter.

The introduction and certification of a quality - management system according to ISO 9000 et seq. has manifold aspects. The previous experience shows that from the multitude of reasons for the introduction of the ISO quality - management system more than 60% come from the external pressure, i.e. from the market. Because of the interactions between the consumption of food of animal origin and the compound - feed market and the need for stabilisation of the market, it is important to extend the quality activities to the total processing chain and to consider the compound - feed industry as a part of this chain. Therefore, a lot of requirements for the proof of the quality ability do not come from the quality interpretation of the feed millers but from the market of meat, milk and eggs and their opinion.

The quality - management system cannot guarantee perfect production without any errors. It is directed to the avoidance of errors and it has the preventive function. Confidence and transparency in the relationship between producer and customer should be developed and used as contribution for improvement of the competitiveness of the feed mills. The documentation and certification gives proof for the fulfilment of the duty for control, order and care.

Before demonstrating the structure of the ISO management system and discussing selected problems of its introduction in feed mills, the term compound - feed quality should be clarified.

## 2. QUALITY OF COMPOUND FEED

The quality of compound feed will frequently be reduced to one or two characteristics, like feed

value, possible feed conversion factor or pellet durability. That is inadmissible and it takes into consideration mainly one - sided interests. The application of known universal valid definitions of the quality term is always possible, but without effect for the relationship between the feed miller and the farmer. Our experience says 4 characteristics - groups should be used at least for describing compound - feed quality:

- nutritional characteristics (composition and content of nutrients and additives, energy, availability of the nutrients etc.)
- characteristics of hygiene and harmlessness to health (number of germs forming units per gram, micro - organisms, salmonellae, content of mycotoxins, moulds and other toxins producing or perishableness promoting substances, period of keep etc.)
- technical characteristics (pellet durability, flowing behaviour, dusting behaviour, mixing homogeneity, structure etc.)
- characteristics of the environmental compatibility after use by animals (phosphorus, nitrate and ammonia pollution of the soil, water and air by the excrements of animals).

The characteristics of environmental compatibility have an increasing importance in regions with high animal concentrations. The ISO - standard determines no limits for the values of the mentioned characteristics. This determination can be a part of the declaration on the quality policy of the company or of the branch association. Mainly, it is a question of the quality level. Only the characteristics of hygiene and harmlessness to health have to be fulfilled independently of the quality level. Deficiencies in one characteristics - group cannot be compensated for by another group.

## 3. STRUCTURE OF THE ISO QUALITY - MANAGEMENT SYSTEM

Because of the function of the quality - management system the determination of the top organisation, clear responsibilities and well - arranged operational procedures for all quality

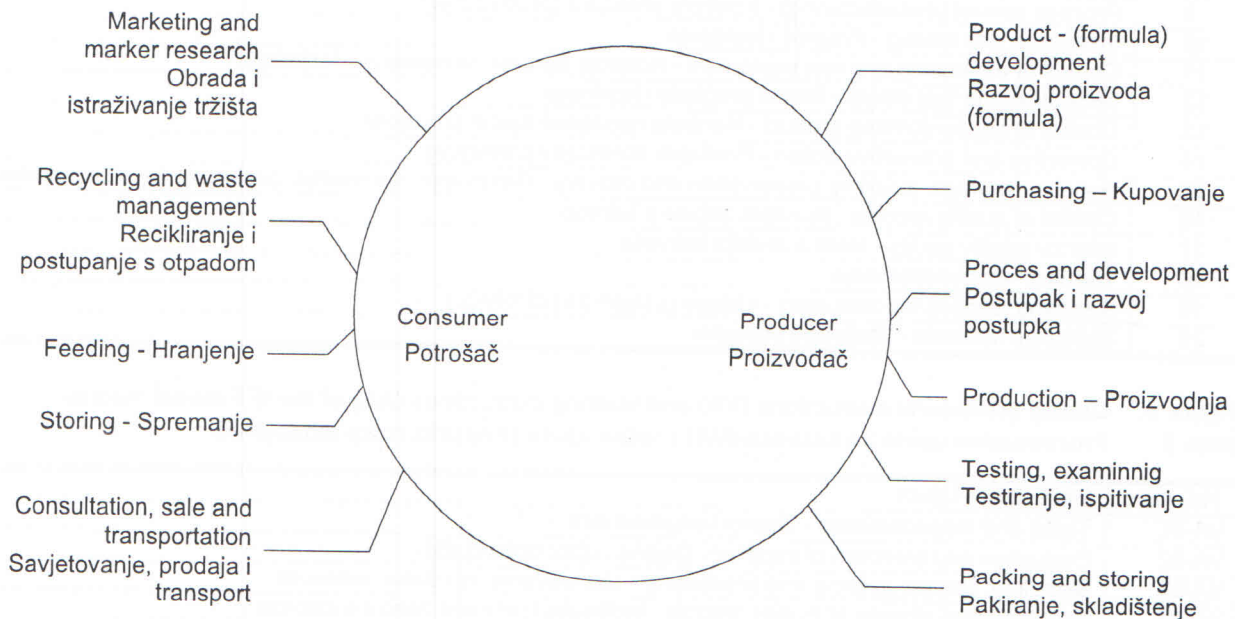
relevant activities, the so - called quality circle (Figure 1) is the basis of the system structure. For compound - feed companies including the product (formulation) development and the procurement of raw materials, premixtures and additives, the model structure according to ISO 9001 has to be used. This model consists of 20 elements (Figure 2), which should be elaborated and documented. The

documentation of the quality - management system includes

- the quality manual containing the description of the 20 elements
- the department overlapping quality procedural instructions
- the job specific quality working instructions.

Figure 1. Quality circle

Slika 1. Kružnica kakvoće



This documentation should be completed by quality records (inspections records, calibration data, audit reports, qualification certificates etc.). The elaboration of the documentation is relatively costly and it should be used for checking all operational procedures in the company in accordance with the requirements and for motivation of the staff by inclusion of the responsible employees in the activities. Many feed mills use the model quality - management manual of the IFF - Research Institute of Feed Technology for the preparation of the company specific documentation. This model manual was discussed by an expert team of feed millers and it gives the complete description of the 20 elements mentioned, including 18 quality procedural instructions and 4 quality working instructions as examples (Figure 3).

The elaboration and installation of the quality - management system in feed mills requires the

solution of branch - specific problems which are particularly founded on the bulky characteristic of the material and the specific quality requirements. Examples are:

- the adequate indication of the raw materials, premixtures, additives and final products
- the representative sampling
- the traceability of the material flow from the delivery back to the receiving of the raw material
- the adequate receiving inspection of raw material
- the proof of the controlled conditions during manufacture
- the fulfilment of the hygienic requirements
- the quality assurance from the manufacture to the use on the farm.

Some selected specific solutions should be explained.

Figure 2. Elements of the quality - management system acc. ISO 9001  
Slika 2. Elementi održavanja sustava kakvoće prema ISO 9001

No. - Broj	Element
1	Management responsibility - Odgovornost upravljanja
2	Quality - management system - Sustav održavanja kakvoće
3	Contract review - Pregled ugovora
4	Product development - Razvoj proizvoda
5	Document and data control - Kontrola dokumenata i podataka
6	Procurement - Nabavljanje
7	Control of customer - supplied product - Kontrola proizvoda nabavljenog od mušterija
8	Product identification and traceability - Identifikacija i podrijetlo proizvoda
9	Process control (manufacturing) - Kontrola postupka (proizvodnje)
10	Inspection and testing - Pregled i testiranje
11	Control of measuring and test equipment - Kontrola opreme za mjerenje i testiranje
12	Inspection and test status - Status pregleda i testiranja
13	Control of nonconforming product - Kontrola neodgovarajućih proizvoda
14	Corrective and preventive action - Postupak korekcije i preventive
15	Handling, storage, packing, preservation and delivery - Rukovanje, spremanje, pakiranje, čuvanje i otprema
16	Control of quality records - Kontrola zapisa o kakvoći
17	Internal quality audits - Interna revizija kakvoće
18	Training - Osposobljavanje
19	Servicing (service for customer) - Usluge (usluge za potrošače)
20	Statistical methods - Statistički postupci

Figure 3. Quality procedural instructions (VA) and working instructions (AA) of the IFF model manual  
Slika 3. Proceduralne upute za kakvoću (VA) i radne upute (AA) priručnika modela IFF

No. - Br.	Instruction - Uputa
VA-01	Tasks and responsibilities - Zadaci i odgovornosti
VA-02	Evaluation and selection of supplier - Ocjena i izbor dobavljača
VA-03	Sampling, sample splitting and processing - Uzorkovanje, razdioba, postupak
VA-04	Indication and storage of quality records - Indikacija i pohrana zapisa o kakvoći
VA-05	Indication and identification of feed stuffs, additives, premixtures and final products Indikacija i identifikacija krme, aditiva, premiksa i konačnih proizvoda
VA-06	Carrying out and evaluation of internal quality audits - Provođenje i ocjena interne revizije kakvoće
VA-07-XX	Manufacturing and control order for premixtures - Nalog za proizvodnju i kontrolu premiksa
VA-08-XX	Manufacturing and control order for compound feed - Nalog za proizvodnju i kontrolu krmnih smjesa
VA-09-XX	Manufacturing and control order for medical feed - Nalog za proizvodnju i kontrolu ljekovite hrane
VA-10	Hygienic regime - Režim higijene
VA-11	Storage rules for raw materials, premixtures and additives - Propisi za skladištenje sirovina, premiksa i aditiva
VA-12	Storage rules for final products - Propisi za skladištenje konačnih proizvoda
VA-13	Analyses of the market - Analiza tržišta
VA-14	Control of contracts - Kontrola ugovora
VA-15	Evaluation of customer feedback information - Procjena povratne informacije mušterije
VA-16	Receiving inspection and control of measuring equipment in the lab Primanje inspekcije i kontrole mjerne opreme u laboratoriju
VA-17	Receiving inspection and control of measuring equipment in the manufacturing area Primanje inspekcije i kontrole mjerne opreme u proizvodnom odjelu
VA-18	Complaints - Pritužbe
AA-01	Batch succession after change of formulation - Slijed serije nakon promjene recepture
AA-02	Mixing instruction - Upute za miješanje
AA-03	Control of the pellet durability - Kontrola trajnosti peleta

#### 4. PROCUREMENT AND RECEIVING INSPECTION

The ISO standard demands the documented evaluation and selection of the supplier. Criteria for the evaluation should be the

- supply ability, flexibility and the prices
- fulfilment of the material specification
- quality ability and its certification
- reliability
- results of investigations into product samples
- fairness of settlement in cases of disputes
- adequate insurance cover for product liability.

The result of this evaluation is the classification of the supplier into categories A, B or C as the consequence of the yearly evaluation of A - supplier, monthly of - B supplier and stop of supply from C - supplier

Premixtures and additives should be taken from ISO - certificated supplier only in order to save the costs for receiving tests.

Contracts with suppliers need completion by quality specifications e.g. for by - products. The use of trade name is insufficient for quality assurance, which requires the operation with defined products. For instance wheat bran can be delivered with different structures, which significantly influence the behaviour as carrier material in premixture.

The receiving inspection and test for raw material cannot include the laboratory analyses in any cases. Sample inspections on the basis of defined sensoric features; such as colour, odour, estimation of moisture and flowing behaviour, content of undesired components and pests are possible and have to be recorded. If no deviations are found the identification of the received material can be carried out in connection with the data sheet for each type of raw material. In cases of deviations laboratory test should be the basis for the decision of the further use of the material which has to be documented too.

The main point for the procurement is change from the term customary and healthy to more specifications in order to ensure the processing of defined materials.

#### 5. CONTROLLED PRODUCTION OF PREMIXTURES AND COMPOUND FEED

The proof of the controlled production includes a lot of feed mill specific aspects. Three essential elements should be explained.

A very important element is carrying out the production on the basis of so - called manufacturing and control orders, which have to be presented written form. By this document the mixture composition, the processing sequence, the operational parameters for machines and plants, the parameters which have to be controlled or monitored and the checkable characteristics of the products are fixed. These orders contain the conditions for the necessary process quality and for monitoring the product quality. Examples for necessary restrictions are the

- use of defined components only
- exclusion of component or additive confusion
- monitoring particle sizes, mixing time, steam quality, feed temperature after conditioning and after cooling, moisture content, complete discharge of the mixer and puffer boxes
- test of the pellet durability
- separation of the fineness before storage
- feed back of filter meals in the same batch.

The fulfilment of the restricted conditions or deviations has to be recorded for each batch with the time scale.

The proof of the operating accuracy for the production plants by experimental results is the fundamental element of the quality ability for feed mills. The operating accuracy of the production plant is more than the usual mixer certificate. Components of the proof of the operating accuracy of production plants in feed mills are the

- actual measured concentration of a micro - component (additive) in the compound feed in comparison with its nominal value in the mixer after mixing time and after conveying, i.e. in the final product (Figure 4)
- degree of mixing (homogeneity) in the mixer after mixing time and in the status as final product (after conveying), expressed by the coefficient of variation (Figure 4)
- contamination of the rinsing batch produced after two test batches (Figure 5).

Figure 4. Comparison of concentration and degree of mixing

Slika 4. Usporedba koncentracije i stupnja izmještanosti

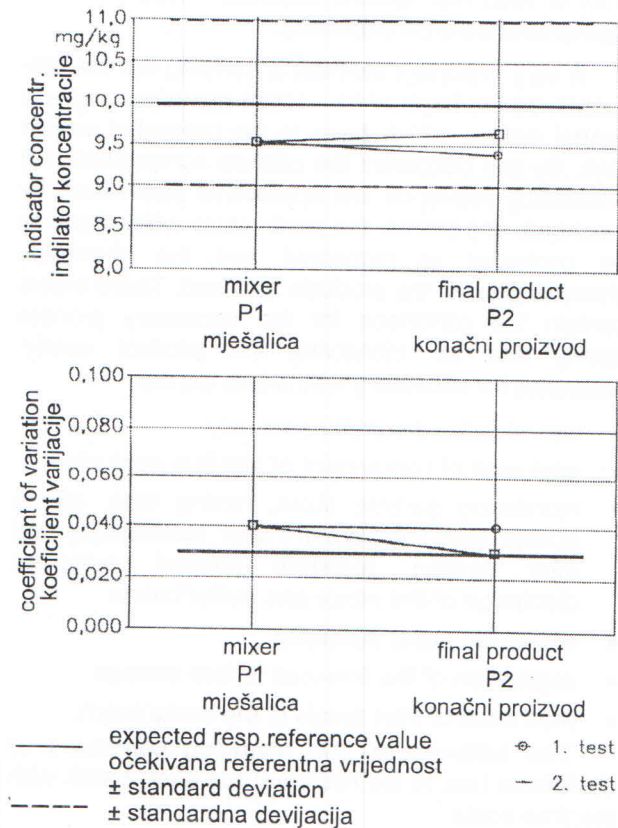
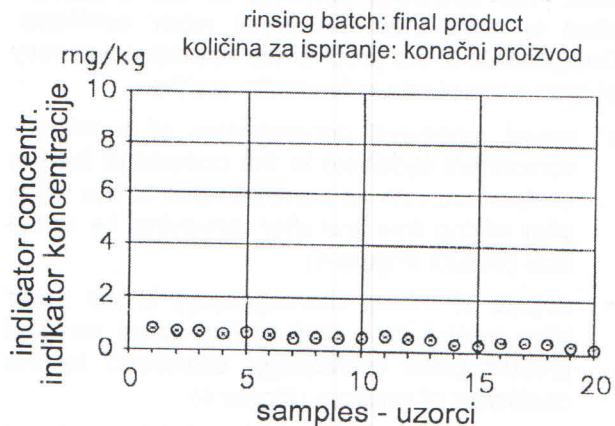


Figure 5. Contamination of the rinsing batch

Slika 5. Kontaminiranost količina za ispiranje



V - 553

F - 552 (carrier material) (nosač)

The demanded operating accuracy for premixture plants is 1:100.000, and for compound-feed plants 1:10.000 according to the German feed law (Weinreich, et al., 1994). Because of the relatively high dispersion of the results of the analysis of real additives in premixtures or compound feed, an indicator substance is used for simulating the behaviour of the micro - component. The indicator substance can be analysed with low dispersion (smaller than the coefficient of variation which should be determined) and it has similar mixing behaviour as the micro - components.

The assessment of the concentration informs about the accuracy of the proportioning equipments, the possible segregation and substance losses. The limits for accepted deviations depend on the kind of substance and should be fixed in accordance with nutritional requirements.

The obtainable homogeneity of the mixture is influenced by the mixer type, mixing time and by the structure of the mixture components. Therefore, the obtained test results are compared with reference to values, which expresses the possible technical level. This level is given by values for the coefficient of variation between 3 and 5% for organic components and between 8 and 12% for inorganic components or relatively coarse structures (e.g. pet food). The importance of the mixing homogeneity and its change in the production plant depends on the formulation of the compound feed and on the daily feeding quantity for the animal.

The contamination of the rinsing batch has the highest importance as the sign of possible carry over, especially in the present time with the explosive increase of the formulations. The usual working diagram of the feed mills is characterised by a single line with high capacity. The tendency of the customer oriented production requires more flexibility and it is connected with the danger of insufficient filling degree of the usual high capacity mixer because of small volume batches and with an accumulation of the carry over because of the frequent change of the formulation. Therefore, the limit of the contamination of rinsing batches should be in accordance with the detection limit for the indicator substance, i.e. smaller than 3% of the nominal concentration on average.

The test for determination of the operating accuracy has to be carried out and certificated by an independent institution at real production conditions. The IFF - Research Institute of Feed Technology has investigated more than 300 plants. Because of the results, some feed mills were obliged to change the equipment. Typical sources of insufficient operational accuracy are

- high deviations of the proportioning equipment
- segregation and carry over during conveying because of too long distances, use of pneumatic conveyers with flying transport or occurrence of other separation effects
- use of unsuitable carrier substances for premixtures or of components with relatively high dustiness
- too much upstream conveying
- insufficient discharge of the mixer or insufficient axial mixing.

Since a few year ago a new type of mixer has been available. In cases of high carry over, rinsing batches are required between batches of different formulations. By the necessary production to the quality system, the fulfilment be seen.

As the result of increasing knowledge and sensitivity of the consumer to the food of animal origin, the hygiene status of the compound feed has become important. The assurance of the hygiene and health harmlessness requires an effective hygiene regime in each feed mill which is an important component of the quality - management system. The hygiene regime of the feed mill consists of preventive measures mainly because of the usual ignorance about possible infections and the responsibility for avoidance of hygienic stresses. The main components of the hygiene regime are the technological treatments and the organisational measures.

The preventive chemical treatment using organic acids takes too much time and relatively high concentrations for the minimum decontamination rate of three decimal power (i.e. from 100.000 to 100 cfu/g). The danger of equipment corrosion, odour pollution and reduced acceptance of the feed by the animal are additional facts for the limitation of the chemical treatment as preventive technology for hygienisation. Organic acids have an

excellent field of application for the preservation of compound feed in order to ensure the obtained hygienic status.

The intensified hydrothermal conditioning realised by the APC - procedure, SIRT - process or BOA - compactor gives different possibilities for preventive decontamination. Recently the highest decontamination rates can be obtained by pressure conditioning realised by the expander. Depending on the operation conditions five to seven decimal power are possible by expanding the compound feed. (Heidenreich and Löwe, 1994, Heidenreich, 1996). Additional effects like starch modification, improvement of the pellet quality, reduction of the press load, increase of the throughput etc. are the result of experimental investigations carried out in the IFF Research Institute of Feed Technology.

Because of the possible recontamination after technological treatment, the decontamination makes sense in connection with the system of organisational measures only. The trend is to distinguish of the dirty and clean part the feed mill into (Rengly, 1996). Therefore, the proof of the quality ability has to include preventive hygienic measures, as follows:

- specifications about the hygiene status of raw materials and premixtures to the supplier
- treatment procedures for contaminated materials and equipment
- avoidance of residues in the production area, boxes, mixers, conveyers
- realisation of the principle "first in - first out" in silos, including avoidance of death zones
- cleaning cycles for production areas, silos, conveyers, boxes, mixers, conditioners, pellet presses and coolers
- cleaning before periods of standstill (e.g. weekend, holidays)
- active control of pests, pigeons and rodents
- minimisation of the contact possibilities with the material flows
- cleaning control for silo tracks
- hygienic requirements to the staff
- limitation of the accessibility to the production area and storerooms.

## 6. INTERNAL AUDITS

By means of internal audits the effectiveness of the quality - management system or its elements will be evaluated periodically. There are special guidelines for auditing quality systems given in ISO 10011 (7). The report on the internal audits should be used for the yearly system review. The internal audit can be directed to the total system (system audit), to one or several elements (element audit), to a process (process audit) or to the product (product audit). In order to ensure the periodical auditing, the company needs an annual plan. Audits should also be carried out because of possible mistakes, errors, changes. The basis of audits are the relevant documents and the precise preparation by the auditors. The company management calls qualified persons as auditors or invites external experts, who do not have any responsibility for the department that should be audited.

In order to spare time, the precise preparation is very important. Therefore, special training of the designated auditors is recommended.

The preparation of an internal audit should include

- decision and reason for the audit resulting in the correct audit order
- decision on the audit type, the objectives, the needed documents, the participants, the location and the time
- nomination of the auditors (two at minimum)
- listing of substantial questions which should be clarified by the audit
- volume and receiver of the audit report
- correct information of all participants.

The experience shows the advisability of ways for preparation, carry out and evaluation. In cases of determined deficiencies checkable corrective actions should be recommended which will be decided with the confirmation of the audit report by the manager or the quality representative.

The periodical auditing of the quality - management system or its elements ensures the effective use of this system, the motivation of the staff members and the avoidance of the danger, that with the certification all the activities pass.

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## SAŽETAK

Za izradu, postavljanje i ovjeravanje ISO sustava za održavanje kakvoće treba novaca i vremena, ali se na taj način poboljšava djelotvornost unutarnje kontrole i pridonosi stabiliziranju tržišta i poboljšanju konkurentnosti tvornica stočne hrane.



Dokumentacija u priručniku poduzeća o kakvoći, postupak i uputa za rad temelj su sustava za kakvoću, a za to je potrebno mnogo vremena. Priručnik IFF (Forschungsinstitut Futtermitteltechnik) uzoraka prati ove postupke u mnogim tvornicama stočne hrane.

Kao rezultat odnosa povjerenja s dobavljačima tvornica za proizvodnju stočne hrane mora biti u mogućnosti upotrijebiti određene materijale odgovarajuće kakvoće samo uz predočenje specifikacije dobavljača.

Propisi za proizvodnju i kontrolu, ovjerovljena točnost rada proizvodnog pogona i djelotvoran režim higijene osnovne su komponente sustava održavanja kakvoće tvornice stočne hrane. Za provođenje ovih zahtjeva potrebni su kvalificirano osoblje i suvremena oprema.

Revizija poslovanja osigurava djelotvornu primjenu uvedenog sustava i njegovu prilagodbu izmijenjenim uvjetima. Do sada ostvarena priznanja pokazuju sposobnost tvornica stočne hrane za održavanje kakvoće u skladu s međunarodnim standardima.



MJEŠAONA STOČNE HRANE

**KUŠIĆ PROMET**

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### Proizvodi:

- Potpune i dopunske krmne smjese za sve vrste i kategorije životinja:
  - perad, svinje, preživače ...
- Predmješavine (premikse):
  - vitaminsko-mikromineralne 0,50 i 1% koncentracije
- KUŠKOVIT DODATKE – vitaminsko-mineralni pripravci za obogaćivanje hrane vitaminima, mineralima i dodacima hrani peradi, svinja, preživača, odnosno 8 i 10% za patke i kokoši nesilice.

Vrši promet domaćih i uvoznih sirovina za proizvodnju stočne hrane: žitarica, uljnih sačmi, fosfata, ribljeg i mesnog brašna i stočnog brašna