MANUAL

PROCESS SEED

A Unit Standard for the Seed Industry

Unit Standard New Draft
NQF Level 3
Credits: 8

Compiled by:
Michael Zingel, Peter Froneman & Bredenkamp Bruwer

Learner Name:

Learner Number:
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This manual was developed by
Sparrow Research and Industrial Consultants CC
e-mail: sparrow3@mweb.co.za
Tel/fax: 012 – 460 9755
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UNIT 1: SEED PROCESSING

1.1.1 Introduction

Seed processing—also called seed conditioning—is an important part of the process of transferring improved genetic material from plant breeders to farmers. Seed received at a processing plant is usually not suitable for sale, plant or reproduce. The contents might contain damaged seeds and seeds infected by fungi. The seed will also not be uniform in size. The purpose of processing seed is to end with a product that will compile with certain standards. These include but are not limited to physical standards and batches of seed uniform in size. Keep in mind the equipment used by farmers to plant seed is preset and seed not sized and cleaned will cause major problems. It is important to realise that the generic purity of the seed must be sustained throughout the process. It is therefore important to start with equipment that are thoroughly cleaned and vacuumed prior to use and which do not contain any other seed or contaminants that may compromise the physical purity of the seed.

All of this emphasises the importance of adhering to work site procedures and statutory regulations. The operator must therefore obtain processing instructions according to procedures and select the appropriate equipment to proceed with seed processing. Also take note of the applicable safety procedures and PPE that must be worn.
Seed processing can involve seven steps: receiving, drying, pre-cleaning, fine cleaning, treating, bagging, and storing.

Figure 1: Flow diagram for seed processing

1.1.2 Drying

Seed lots received from the field are often at high moisture content. Seed processing is necessary in order to dry the seeds to a safe moisture level. If the seeds are very moist and cleaning is done by machines, it may be necessary to dry the seeds within the
accepted range prescribed by the work site procedures and the statutory requirements. The complete drying process is covered in a separate Unit standard (refer drying of seed).

1.1.3 Cleaning

This is the removal of any debris or low quality, infested or infected seeds and seeds of other species, such as other crop seeds and weed seeds, which are foreign to the sample. Debris and infected seeds can spread infection. Therefore only good quality non-infected seeds (upon physical inspection) should be dispatched to clients and damaged or infected seeds should be destroyed to prevent the spread of infection. Cleaning should be done in a way that causes the least damage to the seed lot with minimum waste of good quality seeds.

1.1.4 Chemical treatment

After they are cleaned, seeds may be chemically treated with fungicides and/or insecticides to combat diseases and pests. Chemical treatment destroys pathogenic organisms on the surface and in the seed; and protects the emerging seedling against insects and fungi in the soil. The seed treatment can be a powder, a liquid or a slurry treatment.

1.1.5 Processing equipment

Different equipment will be used on different seed types. Pre-cleaners will remove foreign material and different equipment can be used to separate the seeds into relevant fractions. Gravity tables are used to further improve quality when damaged seeds (mechanical or immature) are removed. All these equipment needs constant monitoring to insure that quality is maintained throughout the process. Samples need to be analysed and equipment needs to be adjusted. Deviations must be communicated to the relevant parties according to work site procedures.

Dryer

Usually, a dehumidified, closed-circuit dryer is used to obtain the acceptable moisture levels.

Air-screen cleaner

This is the basic cleaner, usually with two air channels and, preferably, four screens. The first air channel (head aspiration) removes dust and light materials as the seed falls from
the feed hopper. The second air channel (tail aspiration) removes light seed and materials after the seed passes through the last screen. Although screen configurations vary considerably, one or two top or scalping screens remove particles larger than the good seed, and one or two bottom or grading screens remove particles smaller than the good seed. Seed aspirators are machines used to separate seed from chaff.

The indented cylinder separates according to length. Since there are often impurities that are either longer or shorter than the crop seed, this machine is often needed.

**Separators**

A length separator is almost always used to clean wheat seed. By using the proper machine configuration, shorter or longer undesirable materials (such as broken grains, weed seeds, oat, barley, etc.) are removed. Broken grains and weed seeds, which are shorter than the good seed, are removed by using cylinders with smaller indents. Larger impurities can be removed by using a cylinder with indents that lift all good seed, but contaminants (wild oats, oats or barley grains and unthreshed glumes) remain in the cylinder.

Other screens can be used to separate seed by width and thickness. They are usually made of iron sheet and are perforated with round or oblong holes. Round perforation screens separate on width.

![Separator screens](image)

**Figure 2: Separator screens**

Air-screen cleaners also separate seeds according to their behaviour in an air stream. The most important characteristic is the weight. Lighter particles such as dust, chaff, empty or partly-filled seeds, husks and glumes will be removed and the heavier seed will fall down through the air stream.
Gravity separator

After the seed is cleaned by the air-screen cleaner and indented cylinder, it may be necessary to use a gravity separator. The gravity separator classifies a seed mixture mainly according to density or specific gravity. It can be used to remove unthreshed glumes, stones and soil particles, which have similar sizes to wheat but different weights. Another application is the removal of weevil-infested grains from the seed lot and upgrading seed (in order to improve germination). Furthermore, wild oats and some barley may be removed from the wheat seed lots, but at the expense of substantial amounts of good seed and only after recycling the material a number of times on the gravity separator.

Even after the seed is cleaned in the air-screen cleaner and the indented cylinder, it may be necessary to obtain higher-quality seed. In such cases, the seed can often be passed over the specific gravity separator.

Spiral separator

The spiral separator separates seed according to their rolling ability and surface texture. It consists of sheet metal strips fitted around a central axis in the form of a spiral.
Magnetic separator

The magnetic separator separates according to the ability of the surface of some seeds to 'hold' iron powder. When the seed is treated with iron filings, rough seed will pick up the filings, while smooth seed will not. An example of this is the separation of dodder (Cuscuta sp. a prohibited weed seed) or other rough seeds from alfalfa, based on seed coat texture. A powder of iron is mixed thoroughly with a seed lot, and the mixture is fed into a magnetized mill that removes dodder, cracked seeds or other rough particles. It should be noted that both of these techniques are seldom 100 percent effective in removing dodder, and they also remove some good alfalfa seed.

Colour separator

Electronic colour separators can separate seed by differences in colour. The colour separator views each seed individually with photoelectric cells. The colour of the seed is compared with a selected background or colour range; discoloured seed is blown out of the seed flow.
Treater

Seed should, if necessary, be treated with the appropriate fungicide to protect the seed and seedling after planting. Insecticides are sometimes applied to protect seed in storage and in the soil. Treatments may be applied to protect the seedlings or adult plants against pathogens carried on or in the seed.

Weighing

The final step is to weigh the proper amount of seed into the proper kind of bag. Seed bags should be of a size that:

- Fits local farmer needs (seed rates and field size).
- Is suitable for storage prior to final packaging.
- Is appropriate to wholesale seed business.

1.1.6 Personal Protective Equipment

Personal Protective Equipment (PPE) is specialised clothing or equipment worn by employees for protection against health and safety hazards. The equipment is designed to protect parts of the body, i.e., eyes, head, face, hands, feet, and ears. The different types of equipment used may differ from one company to the next. If you are responsible for wrapping and bulking of seed containers, you must be familiarised with the appropriate equipment worn at your workplace and the location of this equipment. For the purpose of this manual the most frequently used PPE will be discussed.

Hard hat

If there is any danger of falling objects or head injury, a hard hat should always be worn.

Gloves

When working with wooden pallets or any type of material which can cause injury to your hands, protective gloves must be worn. There are many different types of gloves, but you
will be provided with those appropriate to your workplace. A special kind of resistant
glove is also necessary when working with dangerous chemicals.

Gloves must be:

- appropriate to the material handled
- worn whenever there is potential for contact with corrosive or toxic materials
- worn whenever there is a possibility of injury to your hands, e.g. when lifting loads manually
- cleaned after use
- replaced periodically depending upon use and type of material handled

**Hearing protection**

Noise is a common problem in many workplaces. High levels of noise can gradually damage your hearing and this is unfortunately a permanent handicap. The following types of hearing protection equipment are available:

- Foam Earplugs
- PVC Earplugs
- Earmuffs

**Safety shoes**

If you work in and around a fabrication workshop there is always a possibility of heavy objects falling on your feet or sharp objects puncturing your foot. Hazardous liquids such as chemicals can spill into your shoes and boots. These hazardous materials can cause chemical and other burns. Heavy machinery, equipment, and other objects can roll over your feet often resulting in broken or crushed bones. Safety shoes are compulsory for all lifting and transferring equipment operators.

**Safety glasses**

Safety glasses are usually made from shatter-resistant plastic lenses to protect the eyes from flying materials. Although safety lenses may be constructed from a variety of materials that vary in impact resistance, certain standards
suggest that they maintain a minimum 1mm thickness at the thinnest point, regardless of material. If chemicals splash in your face or eyes, flush skin and eyes with water for at least 15 minutes and then get medical attention.

**Respirators / Dust masks**

A dust mask should always be worn when working with harmful gases and in areas with a lot of dust. Special masks protecting the respiratory (breathing) canal must be worn when working with extremely dangerous gases or in areas with a high carbon monoxide concentration. These masks are also to be worn when treating seed with an insecticide and fungicide, especially the powder types.

### 1.1.7 Restoring work area

During the process the sized seed must be weight, the relevant documentation completed and the seed must be transferred back to the warehouse according to worksite procedures. All unused material must be removed and samples of the processed seed must be obtained and submitted to the relevant parties. Work site procedures will prescribe relevant documentation to be completed and distributed.

During processing, strict attention should be paid to the cleanliness of the processing machines and any admixture should be avoided. Every processing plant should have a complete set of hand screens, a small air-screen cleaner and an indented cylinder to help determine the proper processing requirements. It is also essential to have an internal quality control laboratory attached to each seed plant with a small seed testing facility. This laboratory unit should constantly monitor the quality of the seed and the efficiency of processing operations.

Seed processing plants can only produce quality seed if high priority is given to cleanliness and seed care. Machines have to be cleaned between different crops and different varieties. Compressed air should be located throughout the plant to ensure that no mixing occurs; all inside parts of cleaning machines should be accessible so that hidden seeds can be removed. Brooms, blowers and vacuum cleaners should be available to clean machines and to remove spilled seed.
CHAPTER II

REQUIREMENTS RELATING TO ESTABLISHMENTS

Requirements for businesses where propagating material is cleansed

6. A premises on which the business of the cleansing of propagating material for sale is conducted, may be registered as an establishment and the registration thereof be renewed if:

(a) the place where seed is stored and cleansed on the premises concerned -

(i) has a solid floor;

(ii) has efficient lighting so that any marks, printing or writing on containers of seed or on labels attached to such containers may readily be read;

(iii) has efficient ventilation so that excessive humidity and high temperatures which may detrimentally affect seed are prevented; and

(iv) is kept in an orderly, tidy and clean condition at all times;

(b) the available facilities at the premises concerned are adequate and sufficient to ensure the satisfactory cleansing of kinds and varieties of seed which are normally handled there;

(c) seed is handled and stored at the premises concerned in such a manner that -

(i) it is protected against damage by insects and rodents;

(ii) cleansed seed is kept separate from uncleansed seed, screenings and from anything else by storing it in separate stores, or by dividing it by means of solid partitions, or by means of spaces at least one metre wide;

(iii) access to each lot of seed can readily be obtained; and

(iv) admixing of seed of different kinds of plants is prevented, except if it is done in order to make up a mixture or to add a pollinator;

(d) there are marked, printed or written on the containers of uncleansed seed at such establishment, or on labels attached to the containers concerned –

(i) the words “uncleansed seed” or "onskoongemaakte saad";

(ii) the kind and variety of the seed concerned; and

(iii) the name and address of the person from whom the seed concerned was received; and

(e) the applicable particulars which are required in terms of these regulations, are marked, printed or written on containers of cleansed seed, or on labels attached to the containers concerned.
CHAPTER III

RECORDS TO BE KEPT AT ESTABLISHMENTS

Records at businesses where propagating material is cleansed

10. The owner or occupier of an establishment at which the business of the cleansing of propagating material for sale is conducted shall, in respect of all seed handled there, keep complete records of:

(a) the date on which the seed concerned was received;

(b) the kind and variety of the seed concerned;

(c) the name and address of the person from whom the seed concerned was received;

(d) the total mass of the seed concerned and the number of containers in which it was contained;

(e) the total mass of the cleansed seed and the number of containers in which it was contained;

(f) the lot number of the cleansed seed, and if such seed was certified after cleansing, also the number of the certificate issued in respect thereof;

(g) the names and addresses of the persons to whom the cleansed seed was supplied;

(h) the mass of cleansed seed which was supplied to each such person; and

(i) the dates on which the cleansed seed was so supplied.
ANNEXURE 2: REFERENCES

This document does not claim to be an original publication. Various sources of information and documents were used when compiling this document. Any neglect to make reference of any source, including an author, website or publication is not through intent. Such omissions should be brought to the attention of SANSOR, who will gladly rectify the omission.

Plant Improvement Act (1976)

http://www.cisco-eagle.com

http://www.cdc.gov
### ANNEXURE 3: UNIT STANDARD

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PURPOSE STATEMENT
A learner who has achieved this unit standard will be competent in:
Perform, without supervision, the processing of seed to the necessary quality standards.

LEARNING ASSUMED TO BE IN PLACE
To enter a learning programme for this unit standard or to be assessed against this unit standard, the learner is assumed to have:
- Literacy, numeracy and communication skills at or equivalent to NQF level 3.
- An understanding of safety in the workplace at NQF level 3.
- An understanding of supplier and customer relationships.
- Basic mechanical skills.
- Introduction to seed industry and relevant workplace.

SPECIFIC OUTCOMES
A learner assessed as competent against this standard will be able to:

OUTCOME A: PREPARE FOR PROCESSING BY: (20)
- Preparing the work area according to work site and safety procedures. (4)
- Obtaining instructions from relevant parties. (4)
- Selecting appropriate equipment according to work site and quality procedures. (8)
- Selecting appropriate personal protective equipment (PPE) according to safety procedures and statutory requirements. (4)

OUTCOME B: PERFORM PROCESSING BY: (36)
- Operating appropriate equipment according to work site and safety procedures. (12)
- Separating seed into relevant fractions according to work site procedures. (8)
- Monitoring the processing function and taking corrective actions (when applicable) according to work site, quality and safety procedures. (12)
- Inform relevant parties of deviations according to work-site procedures. (4)

OUTCOME C: COMPLETE PROCESSING OF SEED BY: (24)
- Arranging for removal of off all material according to work site and quality procedures as well as statutory requirements. (4)
- Complete documentation as per work site procedures. (4)
- Forwarding the seed to the following operation according to work site procedures. (4)
- Shutting down equipment and restoring work area according to work site, safety and quality procedures. (8)
- Informing relevant parties on completion according to work site procedures. (4)
ASSESSMENT CRITERIA
Assessors will observe, confirm and evaluate evidence that will indicate that learners have demonstrated competence in each of the specific outcomes. In this unit standard the following specific criteria should be used:

- Job instructions, oral or written, are accurately followed and adhered to.
- Appropriate equipment are identified and selected according to work site procedures.
- Purpose of processing seed according to work site procedures is explained.
- Consequences of not monitoring, processing and taking corrective actions are explained.
- Purpose of preparing the work area is explained.
- Reasons for adhering to safety and quality procedures.

ACCREDITATION AND MODERATION PROCESS AND CRITERIA: (Mechanisms and bodies for external moderation of learner achievements)
- An individual wishing to be assessed against this unit standard may apply to an assessor accredited by SETASA.
- Any training provider offering learning that will enable achievement of this unit standard must be registered and accredited by SETASA.
- Moderation of assessment will be done by SETASA in its ETQA capacity at its discretion.

RANGE STATEMENT (General guide for scope, context and level)
- The scope of this unit standard deals with the processing of seed without direct supervision, but with access to work-site, operating and safety procedures and statutory requirements.
- Equipment will include but is not limited to an aspirator, pre-cleaner, sizer, gravity cleaner, length grader, spiral separator, primer, water separator, colour sorter (electronic eye), de-fuzzer, hand sorter.

NOTES (1)
CRITICAL CROSS FIELD OUTCOMES: (What abilities must I use)
- Work effectively with others when receiving information and giving instructions.
- Organise and manage oneself when planning and performing the process.
- Communicate with others.
- Identify and solve problems during processing.
- Use science and technology when operating equipment.
- Understand the world as a set of related systems when dealing with hazardous substances when not adhering to safety and statutory requirements.
NOTES (2)

ESSENTIAL EMBEDDED KNOWLEDGE (Knowledge that will help me understand and that I will be able to explain)

- Basic knowledge of the safe handling of equipment related to processing of seed.
- Basic knowledge of maintenance and caring for relevant equipment.
- Operating instructions of processing equipment.

NOTES (3)

VALUES

All learners should demonstrate:

- An application of company ethics, values as well as general safety and customer care principles.
- An awareness of expectations and obligations of basic worker / management / customer relationships.