CORN SEED PROCESSING PROCESS AT DUPONT DO BRASIL S.A-PIONEER SEMENTES DIVISION

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ABSTRACT

Corn is one of the most important cash crops originating in the Americas. Although of tropical origin, it is cultivated in practically all parts of the world. It stands out in the Brazilian agribusiness scenario as one of the most important commodities. In the past, seeds from one harvest were produced to be sold only in the following year's harvest. Currently, most of the seeds produced in the harvest are already sold in the "off-season" and those produced in the "off-season" are sold in the harvest. Therefore, the processing of corn seeds plays a fundamental role in the seed production chain, being operationally specialized when compared to other large crops. The corn cob is usually harvested, handled, peeled and dried, to later be threshed, cleaned, classified, treated and bagged. The companies stand out in the international market as leaders in seed production, meeting the most specific needs of the producer when selecting materials, harvest after harvest and Pioneer's business in Brazil is directed more intensely to the hybrid corn, popcorn and soybean seed market.

Keywords: Classification. Treatment. Storage.

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INTRODUCTION

Currently, Brazil has a very relevant position in world agriculture, the result of a transformation that has occurred in the last 40 years, through the process of modernization. It has become the country with the most possibilities to increase its production in response to the increase in local and, especially, international demand. The corn crop stands out in the Brazilian agribusiness scenario as one of the most important commodities.

According to CONAB (2013), the area planted with grains in the 2012/2013 harvest, estimated at 53.23 million hectares, is 4.6%, equivalent to 2.34 million hectares larger than that cultivated in 2011/2012, which totaled 50.89 million hectares. In relation to production, the 2012/13 harvest, estimated at 185.05 million tons, is 11.4% higher than the 2011/12 harvest, when it reached 166.17 million tons.

The reason for the increase in crops was the change in the concept of agriculture. In the past, farmers produced only one crop per year in the area, but with changes in concepts, it was possible to produce two crops per year in the same area. Later, there was also an advance in agriculture in the Brazilian cerrado: the use of two crops per year by farmers, the harvest and the off-season. The area cultivated with corn, first and second crops, totals 15.84 million hectares, as a result of which there was a growth of 4.4%, equivalent to 665.6 thousand hectares (CONAB, 2013).

In the past, seeds from one harvest were produced to be sold only in the following year's harvest. Currently, most of the seeds produced in the harvest are already sold in the "off-season" and those produced in the "off-season" are sold in the harvest.

In Brazil, there are also differences between the various groups of producers with regard to the use of more or less advanced technologies in corn production (GARCIA, 1987). There is a large portion of small producers who do not care about commercial production and high productivity rates, and a small portion of large producers, with high productivity rates, using more land, more capital and more technology in production.

The objective of this work was to report the internship carried out at Dupont do Brasil S.A - Pioneer Seeds Division in the production unit, in which an "Integration" work was carried out, to transmit the standards of safety, ethics, product quality and social responsibility of the company. And obtain knowledge of all production processes, assisting the team of each sector in the activities whenever possible.

THEORETICAL FRAMEWORK

Corn is one of the most important cash crops originating in the Americas. Although of tropical origin, it is cultivated in practically all parts of the world. Its economic importance is characterized by its various forms of use (DUARTE, 2004).

The seed input plays an important role in the development of agriculture, and contributes greatly to increasing productivity. It is necessary that the seed reaches the hands of the farmer with good genetic, physiological, sanitary and physical quality and also in adequate quantities in a timely manner for the rural producer (VON PINHO, 1999).

Processing is an essential part of the various stages of seed production, when the lots need to be handled properly to improve quality. Size and density are differential factors used in the separations carried out during processing (VAUGHAN et al., 1976).

The processing of corn seeds is operationally specialized when compared to that of other large crops. The corn cob is usually harvested, handled, peeled and dried, to later be threshed, cleaned, classified, treated and bagged. Classification is a process of extreme necessity and importance, due to the great variation in size, shape and quality of the seeds on the ear itself. In addition, density separation is essential to finish the improvement of the physiological quality of the seed lot.

Representing the final stage of the production process, processing refers to all the stages of seed preparation for commercialization, carried out after harvest, such as pre-cleaning threshing, drying, cleaning, standardization, treatment and packaging (VON PINHO, 1999).

According to Silveira & Vieira (1982), the final quality of the seed depends on the care taken to maintain the quality obtained in the field during processing and storage, minimizing the injuries that occur during processing, especially mechanical injuries.

For Delouche (1967), any equipment used in handling is a source of mechanical damage and contamination. The conveyors, elevators and other equipment used to move seeds, from harvesting, processing and packaging, can have an influence on the quality of the seed.

The ability of a seed to produce a normal plant can be reduced or nullified by mechanical injuries caused during processing (GREGG et al., 1970).

Amaral et al. (1984) found that the use of air machines and sieves and gravity table eliminated undesirable materials, increasing the physical and sanitary purity of pea seed lots.

Lollato & Silva (1984) and Buitrago et al. (1991) found that bean seeds processed on the gravity table had better physical, physiological and sanitary qualities.

Assmann (1983), working with soybeans, found that the gravity table separated the heavier seeds from the lighter ones, managing to separate the deteriorated, insect-damaged, mechanically damaged and dead seeds, improving the physical and physiological characteristics of the low and medium vigor lots.

Matthews & Boyd (1969) observed that beneficiation, in addition to improving the physical quality of a flock, can increase physiological quality, if any of the physical properties are related to vigor

The companies stand out in the international market as leaders in seed production, meeting the most specific needs of the producer when selecting materials, harvest after harvest.

Pioneer's business in Brazil is directed more intensely to the market of hybrid corn, popcorn and soybean seeds, and the company was a pioneer in Latin America to obtain the ISO 9001 certificate, both for production units and for its seed analysis laboratories, thus fitting into a strict quality standard.

The company also has several research stations throughout Brazil. At its stations, researchers work on the genetic improvement of soybean varieties and corn and sorghum hybrids. With advanced technologies, Pioneer has been focusing its research and development on products for the grain market of high quality and health, being grains with high oil and protein content for use in animal feed, as well as corn hybrids with special characteristics for the production of whole plant silage and wet grain.

With all this, the company stands out in the international market, as a leader in seed production, meeting the most specific needs of the producer when selecting materials, season after season.

COMPANY DESCRIPTION

Pioneer is a multinational company that originated in the United States, more specifically in the city of Johnston in the state of Iowa, where it was created in 1913.

Henry Wallace, its founder, was a researcher who started a corn seed breeding program. The studies of the bloodlines and their crosses were so successful that in 1924, Henry Wallace won a productivity contest. In 1926, Wallace founded Pioneer Hi-Bred, being the first company dedicated to developing, producing and marketing hybrid corn seeds.

In Brazil, Pioneer began its activities in 1970, through a commercial partnership with Proagro – Comércio e Indústria Pró – Pecuária Ltda., of the Gomes Filho Group, from Bagé – RS. In May 1972, the formation of the company Proagro Pioneer S.A. - Agricultura,

Indústria e Comércio, headquartered in Porto Alegre, was announced. In January 1976, the company transferred its headquarters to Santa Cruz do Sul – RS, where its headquarters are fixed to the present day.

In June 1982, the shareholding control became fully owned by Pioneer Hi-Bred International, headquartered in Des Moines, Iowa – USA, and thus Proagro Pioneer ceased to exist, establishing Pioneer Sementes Ltda. On March 15, 1999, Pioneer Hi-Bred International was acquired by the traditional multinational company DuPont, headquartered in the city of Wilmington, in the state of Delaware in the USA. In Brazil, Pioneer Sementes was officially incorporated by Dupont do Brasil in November 2005, currently having the following corporate name: Dupont do Brasil S.A. – Pioneer Sementes Division.

Today, Pioneer Sementes has five processing units in Brazil, two in Goiás (Itumbiara and Formosa), one in the Federal District (Brasília), and two others in Rio Grande do Sul (Santa Rosa and Santa Cruz do Sul), but in 2012 Pioneer inaugurated another unit, in the city of Catalão – GO, processing soybean seeds (Figure 1).

Figure 1 – Geographic distribution of the company's operations in Brazil

Source: DuPont Pioneer, 2013

ITUMBIARA UNIT

The Itumbiara unit is multidepartmental, there is not only the production of seed of commercial hybrids, there is the production of matrix seed, production research and seed quality laboratory, in the city of Itumbiara there is still a research station.

The production department is responsible for carrying out the process that begins with the receipt of the seed from the lines that will generate the hybrids until the shipment of the seed bags to producers, branches or resellers.

The mother seed department is responsible for multiplying the strains developed by the research, so that it can meet the demand of the production units. The mother seed processing unit located in Itumbiara is responsible for all the supply of mother seed to all units in Brazil, it also exports lines to some countries.

The production research department is responsible for designing and conducting experimental trials, which allow providing information about the strains to the production department. The information provided is extremely important for you to achieve acceptable yields, since the strain usually has a low productive potential.

The seed quality laboratory is responsible for carrying out the analyses of the corn seeds produced by the mother seed and production, in addition to the analyses necessary for research and production research, throughout Brazil. The analyzes carried out range from physical purity, where the existence of material other than corn seeds is analyzed, there are also physiological quality tests, where the germination and vigor of the seeds are verified, and genetic testing, where possible genetic contamination in the lots is verified.

The research station located in Itumbiara works together with the company's other stations, spread around the world, its focus is to develop corn hybrids for areas of north-central Brazil with low altitude.

MATERIALS AND METHODS

SEED FIELDS

Corn seed fields are usually made in places that have a pivot-type irrigation system, there is the possibility of planting in a non-irrigated area, but this occurs in sporadic situations. The Itumbiara unit establishes its seed fields in some regions that have the necessary characteristics for the production of corn seeds, these regions are called production centers. The production centers need to have some basic characteristics, availability of irrigated area, be at a favorable altitude for corn production, in the range of 600 to 1000 meters and not be far from the UBS, today the most distant fields are 300 kilometers away.

Currently, the Itumbiara unit works with three production centers, the Morrinhos center, the Paraúna center and the Minas Gerais center, each center groups a group of municipalities.

- The Morrinhos nucleus has as main municipalities: Morrinhos, Goiatuba, Pontalina, Vicentinópolis, Vianópolis and Piracanjuba;
- The Paraúna nucleus has as main municipalities: Paraúna, Palmeiras de Goiás, Rio Verde and Acreúna;

The Minas Gerais nucleus has as main municipalities: Uberlândia, Iraí de Minas, Patrocínio, Monte Carmelo and Monte Alegre de Minas.

In the nuclei of Morinhos and Paraúna there is a summer harvest and an off-season off-season harvest, in the nucleus of Minas Gerais it is planted only in the summer harvest. The company's production system is a system of cooperativism, where responsibilities are divided between the producer and the company:

The company is responsible for the supply of seeds, insecticides and fungicides, detasseling operation, core cutting and harvesting.

The cooperative member is responsible for the supply and application of herbicide, fertilizer, in addition to the application of other pesticides supplied by the company, planting and irrigation are carried out by the producer. The cooperative member must necessarily be the owner or tenant of the area and the pivot.

In each nucleus there is a field team, which is made up of agricultural technicians and agronomists, who are responsible for advising the cooperative producers and supervising the operations carried out, monitoring all stages, from planting to harvesting.

BENEFICIATION UNIT

Weighing and Receiving of ears

Upon arrival of the truck at the entrance, the driver must present the note, and the concierge writes down all the necessary data (driver's name, carrier, license plate), soon after the truck is sent to the scale. On the scale, the person responsible for weighing must check the documentation (invoice of the shipment of the harvested material with the breakdown of the type of material, delivery order, truck departure time, delivery number, crop number and breakdown of the producer's name). After weighing, the driver must pick up the scale ticket, where this ticket contains all the necessary data for the quality control of this load in the unit (name of the cooperative, farm, UBS, crop, material, lot, seed category, initial and final moisture of the seeds, impurities/straw, initial weight and final weight of the sample, last load of the crop: Yes or no, approval of the load, quality of the seed, responsible for checking the load, distance from the crop, carrier code, truck plate, line on which the load will be received, gross weight of the trailer, tare weight of the trailer, and net weight of the load). With the scale ticket in hand, the driver goes to the receiving to unload the material on the receiving line.

Receiving at the Pioneer unit in Itumbiara-GO is done in ears, and the average receiving capacity is 20 tons/hour.

The Itumbiara unit has two reception lines, being located next to each other, from this the lines are called side A and side B.

The employee responsible for unloading, based on a receipt control spreadsheet, delivered to him by the sector leader, will define which truck will be unloaded next and which line will be received. When defining the trailer to be unloaded, the employee checks the scale ticket and guides the correct parking position of the trailer. With the truck parked, the employee explains the safety procedures to the driver and asks him to get off the truck and give him the keys to it, then the same employee through a thermometer called "Datalog" checks the temperature of the truck, where it cannot exceed 41°C, due to consequent problems in the physiological quality of the material. The temperature of the truck is checked at four different points, and thus an average is obtained. For trucks that exceed this temperature limit, a notification and decision report (RND) is opened, segregating the material for later analysis of longevity and vigor in the laboratory.

Before unloading the material, other employees in the sector put the chocks on the rear tires of the truck. Soon after, the employees carry out the operational procedure of opening and unloading the truck. At the Pioneer unit in Itumbiara, the unloading of the trailer is done through a tarpaulin that is located below the load, so that when this tarpaulin is pulled, the load is unloaded at the dumper. To pull this load, the tip of the canvas is connected to a hydraulic drive roller, where it is rolled up and consequently pulling the load towards the tipper. When the unloading is finished, the tarpaulin is placed again on the floor of the truck, but this tarpaulin is placed folded, so that it does not break in the unloading of the next load.

In sequence, the ears with straw that were unloaded in the dumper are directed to the hoppers of the spreaders through a belt called "plow off". Each receiving side contains 7 spreaders, with a consequent 7 tables for manual ear selection.

When falling into the spreaders, the ears are spread by spreader rollers, and the straw is directed to the refuse belt where it will be unloaded into a refuse collection truck. The scattered ears will be directed to the selection tables. Each hybrid to be de-spread has a preferential side, and a specific adjustment in the despreader, to avoid excessive losses or delay in unloading the material. Upon arriving at the selection tables, the employees select the bad ears (where they will be directed to the discard belt), the ears not yet stripped (where they will be directed to the return belt) and the ears of atypical characteristics (where they will be directed to the discard belt). The good ears will go to the drying process.

Still in the receiving sector, there are some samples to determine the quality of the material being unloaded.

To determine the initial moisture content of the seeds, 10 ears are sampled as soon as the trailer doors are opened. With the help of the lime Soon after, 35 to 40 grams of seeds are weighed and then crushed. From this material, 3 to 4 grams are taken and placed in the tray of a device called OHAUS. The value obtained is entered in a spreadsheet where the corrected value is determined.

For waste sampling of the spreaders and selection table, a sampling box is pushed on the waste belt and only removed when it is full. Subsequently, this scrap material is glued to a plastic bucket and then placed in the sample separation box. This sample sorting box consists of a wooden box with a sieve at its bottom that will separate the threshed seeds from the straw, the ears crushed by the rollers of the spreader, and the ears discarded by the sorting table. Soon after, the separated materials are weighed and thus the percentage of discards of each type of waste is obtained.

Finally, the last sampling done at the receipt will determine the percentage of straw of the material to be discharged. Sampling is done on the inclined conveyor belt (before reaching the hoppers of the spreaders), and 1 linear meter of the material is collected. Soon after, the sample is weighed with straw, which must weigh between 18 and 22 kg. Soon after, the material is manually peeled and weighed again. From the difference of the two weighings, the weight of the straw and consequently its percentage are obtained.

Drying and threshing of ears

Freshly harvested ears may have an inadequate content for storage, depending on variable factors during harvest. The high moisture content can affect the quality not only during the storage period, but also hinder the efficiency of the machines used in processing.

The most appropriate time to harvest the seeds is as close as possible to physiological maturity. For corn, the physiological maturity of the seeds can vary between 28 and 42% moisture, depending on the hybrid.

Drying on ears is carried out when the seeds have moisture content around 28 to 35%, or at their physiological maturity, thus ensuring high quality. Drying on the cob prevents the embryo from suffering direct action from temperature and also from mechanical damage.

The material that was selected at the receipt will be destined for the dryer, for this the tripper is positioned in the destination drying chamber.

The Pioneer dryer consists of 5 drying buildings totaling 66 fixed-bed drying chambers, with each chamber having an average capacity of 75,000 kg wet and 30 to 35,000 kg of dry cobs.

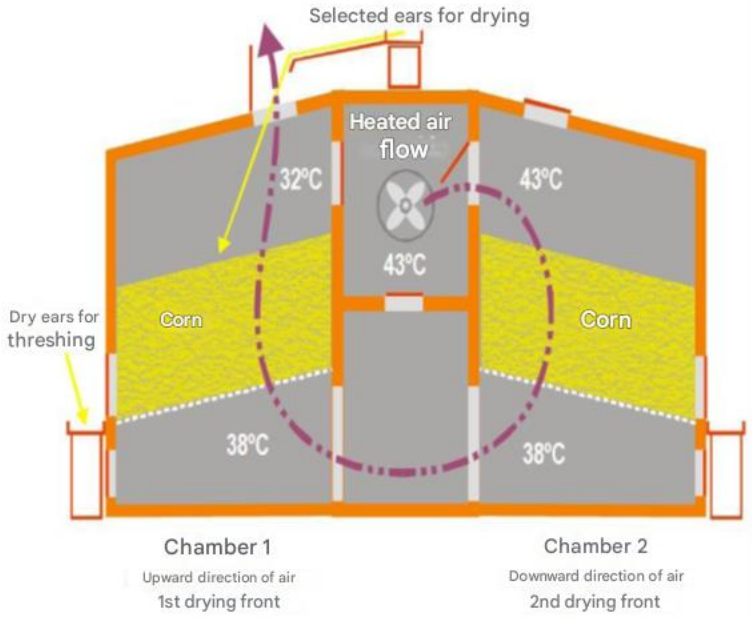
The drying of the ears will work in stationary layers, with upward and later downward air flow, until the material obtains the final desirable moisture of 12%. As a source of heat for drying the seeds, Pioneer uses a furnace system, where the dry cob obtained in the threshing is used, thus saving on energy sources. This cob that would become a disposal problem at Pioneer is seen as a solution, since its burning will generate heat energy for the drying of the wet material that reached the chambers. This cob in the threshing process is separated from the seeds by a sieve and stored in silos, so that when the furnaces need cobs they can automatically supply them.

The drying process is seen as a critical point in interfering with the physiological quality of the seeds, since for each hybrid there is a drying time, a filling height of the chamber and an adequate air flow.

When the seeds arrive at the drying chamber, they receive the upward air flow at a maximum temperature of 38°C and minimum relative humidity of 35%, when the inversion time is given, the inversion test is done to check the moisture of the seeds. After the test, the chamber's airflow is reversed, working with a maximum temperature of 43°C and minimum relative humidity of 20%. The drying period at the rising moment is the most critical in the process, since a temperature above 38°C can cause the pericarp of the seed to crack. Thus, the regulation of this process should be observed, as the rupture of the pericarp will result in less longevity due to the increase in gas exchange between the seed and the medium.

To regulate this process, the psychrometric chart is used, which is based on the ambient temperature and relative humidity, determining the ideal air temperature that the furnace should heat, so that the air sent to the drying chambers by the ventilation of the upper tunnel reaches the drying chambers at around 20% humidity, in the downward direction (Figure 2).

Figure 2. Diagram of operation of a drying chamber.



The downward airflow reaches chamber 2 through the upper tunnel vent. When it reaches chamber 2, the air has a relative humidity of around 20%, but when it passes through chamber 2, this air flow takes with it the moisture extracted from the ears stored in the chamber, reaching the lower tunnel with a higher relative humidity, around 45%, and so the same will happen at the end of its passage through chamber 1, where this flow will present an even higher relative humidity (around 75%).

To ensure the physiological quality of the seeds, preliminary tests of sensitivity to drying carried out in the production research sector give security as to the drying speed, chamber filling height and ideal air flow to be used.

Some tests serve as parameters to determine the exact moment when the seed has adequate moisture (12%) for threshing. The tests used are:

- Hours of drying.
- Temperature difference of inlet and outlet of the air to the chamber.
- Difference in relative humidity of air inlet and outlet to the chamber.
- Humidity test.

The moisture test is the most important and reliable, being carried out with the help of a screw-type sampler, where samples are collected at 3 points in the chamber. After collection, the ears are threshed with the help of a lime The seeds that have been threshed are packed in a small pot, where the moisture test is later done in a device called GAC, to determine if the seeds are really suitable for threshing.

After the moisture test and confirming the moisture content of 12% of the seeds, the ears are directed to the threshing building. The threshing building consists of 40 silos with a capacity of up to 160 thousand kg each.

The thresher has the capacity to thresh 60 tons/hour, working in order to press and rub the ears against each other, which reduces damage to the seeds. Just below the thresher there is a sieve responsible for separating the cob from the seed mass.

The pre-cleaning machine located further down the thresher removes cob residues, small grains and dust from the seed mass. After threshing, the seeds are transported to the silos via elevators and belts.

Before arriving at the silos, still on the conveyor belt, the seeds are treated with insecticides (Actellic and K-Obiol), to protect against stored grain pests (moths, weevils and caterpillars).

For seed unloading, the silos have an impact damping system, to prevent mechanical damage and consequent reduction of the productive potential. In the silos, sensors monitor the temperature of the seeds inside the silos and activate the aeration system depending on the environmental conditions and conservation parameters of the stored seeds. Thus, the aeration system keeps the seeds in ideal temperature conditions to ensure quality during storage.

Classification, Treatment and Bagging Tower

The Pioneer tower in Itumbiara has 5 floors, with an average sorting capacity of 20 thousand kg / hour, depending on the hybrid.

The access of the seeds from the silos to the tower is done via conveyor belts. Upon arriving at the tower, the seeds are directed by the DRM to the buffer silos. These silos house the seeds that will later be classified.

The stage prior to classifying the seeds consists of a pre-cleaning process, where large amounts of dust, broken seeds and pieces of cob are discarded.

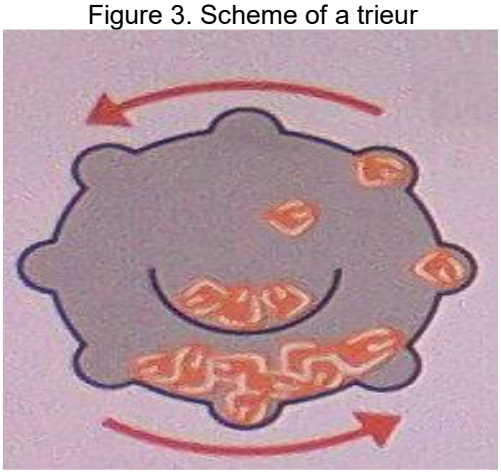
When going through pre-cleaning, the seeds are sent to a machine called "CARTER DAY", where it is composed of a set of 6 perforated cylinders that work like a sieve, rotating horizontally, thus classifying the seeds first by width and later by thickness. The seeds enter the cylinder through one end, and the rotation of the cylinder turns the seeds in such a way that each seed, individually, will be positioned in order to present the appropriate dimensions for the perforations, so that the smaller seeds pass through the perforations and are transported to a discharge spout. As the larger seeds do not pass through these perforations, they move along the entire length of the cylinder, being discharged into

another discharge spout. With this, the larger and smaller seeds will be destined for another Carter Day, but the larger ones will now separate by thickness, separating flat seeds from round seeds. In this way, several cylinders are mounted in sequence, in order to allow separations in different sizes in a single continuous flow operation.

After separation into width and thickness, the seeds will be sorted by length. The machine used to separate the seeds according to length is a honeycomb cylinder separator called a trieur.

The trieur consists of a cylinder with alveoli of defined size on its internal surface, a chute for seed collection, discharge screws, flow retarder, cylinder tilter and pulley of variable diameter and through its reducers rotates counterclockwise, separating short, medium and long seeds (Figure 3).

Figure 3. Scheme of a trieur



The trieur works in such a way that the short seeds fit into the cells and are discharged over the chute to later fall into a spout and be housed in a silo.

After separation in length, the seeds will be separated by specific weight. For this operation, the gravity table is used.

The gravity table is composed of a perforated cover, allowing the passage of air, in an upward direction. The air is adjusted to lift light seeds, while heavy ones remain on the table surface, separating the seeds into stratified layers. With the elliptical movement of the table and with the inclinations of the table lid, the lighter seeds, present in the upper extract, flow downward and are discharged at the lower discharge edge of the table. The heavy seeds are led upwards, concentrating in the highest part of the table, where they are discharged. Between the outputs of light and heavy seeds, there is an intermediate material formed by medium seeds, which will return to the process and will be gravitated again.

After the entire classification process, the seeds will be taken to treatment, for subsequent bagging of them.

There are 2 types of treaters in the Pioneer tower, the conventional and continuous flow treatment treater, and the additional treatment and batch flow treater, treating 200 Kg of seeds/batch.

The conventional treatment is composed only of the fungicide Maxim (fludioxonil), which is a systemic and contact fungicide. For additional treatment, there are several combinations of insecticides, fungicides and even polymers.

Treated seeds are identified with a dye, thus differentiating from untreated seeds. The treatment is intended to protect the seeds against the attack of fungi and pests in the period of emergence in the field, or even in storage.

The demand for additional treatment is growing in expansion, due to the ease and convenience it offers to the producer. For additional treatment there is a varied mix of products, such as insecticides: Standak, Cruizer, Poncho and fungicide: Maxim, in addition to the use of Polymer.

The polymer is important to ensure the attachment of the products to the seed, thus not allowing soil moisture to disaggregate the products from the seeds.

In Itumbiara, there are 2 bagging lines, one semi-manual and the other fully automated. The bagging works in three shifts, and the average bagging in this winter harvest of 2011 was 6 thousand bags per day. However, the company's record for withdrawals in a working day is 21 thousand bags.

The bagging scale will release the seeds after treatment in variable quantities according to the data passed to the machine operator, such as (lot weight, number of bags, bag size, hybrid identification). Each bag contains 60 thousand seeds, and to guarantee this number Pioneer works with the addition of 5% more seeds per bag.

Printing on the bag is also carried out in this sector, with data such as: batch, hybrid, sieve, disc suggestion and net weight being printed. The sack is standardized with the company's requirements and is made of multiwall paper.

After bagging, the bags are placed on the pallets and sent to a cold chamber (10°C) for greater longevity of the seeds.

At the end of the treatment and also at the end of the classification, the company plants all seed lots. Plantability simulates field sowing, identifying percentages of failures and doubles. Also through plantability and the best discs for each hybrid and sieve are indicated, thus guaranteeing the producer a good final stand in his crop.

Storage and Shipping

When the product is ready, it is accommodated on pallets, facilitating its movement within the warehouse, such as the use of forklifts. Bags of corn seed are stored in cold chambers, at 10ºC and 50% relative humidity. These conditions are necessary to preserve the quality of the seed and extend its shelf life.

The unit's production is shipped in two ways, on pallets or in "beaten load". Shipping on pallets is mainly done when the product will be transferred to a branch or delivered to cooperatives and resellers, there are also large producers who receive it on pallets. Shipment in "hit loads" is when the bags are removed from the pallets and allocated directly to the truck body. It is done this way when the recipient does not have equipment to remove the pallets from the truck. The "beaten load" is mainly used when it comes to direct delivery to the customer.

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