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PLANNING A NEW SEED PROCESSING PLANT

B. R. Gregg ^{1/}IS A NEW PLANT NEEDED?

Each year established processing firms build new plants, and new firms and plants are organized. The success of commercial seed processing operations, as with other types of business, depends upon potential volume, efficient operation, variety and quality of services offered, and progressive management. Before a new plant is built, a thorough investigation of the cost of construction and operation of the plant, and the potential business volume, should be made.

Among the factors to be considered are:

1. Crops produced for seed in an area and volume of production.
This determines the machinery needed.
2. Weeds common to the area.
Weed seeds also affect choice of machinery.
3. Is the volume of seed cleaning sufficient to justify the initial cost of a seed processing plant?

If volume is sufficient, then expected volume will be the deciding factor in determining the size of plant needed, the capacity and number of cleaning machines, the number and size of seed bins, and the loading-unloading equipment needed.

4. What capacity per hour of seed flow will be needed? Are planting seasons and market activity relatively soon after harvest, or can processing be spread over the winter?
5. Competition:

Are there other cleaning plants serving the same area?

How busy is the other plant?

What services does it offer?

What are his charges for custom cleaning?

Does he also buy and sell seeds wholesale?

Are the potential customers satisfied with his service?

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6. Type and cost of necessary equipment.
Equipment is usually a large part of the initial investment.
7. Size and type of building needed for cleaning and storing seed.

Is a suitable building available?

Will it be necessary to erect a new building?

Will the building allow low cost, efficient operations?

What are insurance rates on this building?

What types of construction are available, or most suitable?

8. Will it be necessary to build seed drying facilities?
9. Source of power for running machinery.

Electricity is essential for uniform, accurate operation of machinery. Three-phase current gives more even operations, which is essential for machines such as gravity separators. Totally-enclosed motors are usually required on seed cleaning machines.

10. Qualifications of the plant manager.
Experience, education, native ability, willingness to learn.
11. Size and location of the plant site:

Size of the operating area.

Size of the storage area.

Rail and highway access.

Unloading and parking facilities.

12. Potential outlet for seed.

Distance from major markets.
Wholesale.
Retail.
13. How will seed be brought to the plant: in bags, in bulk, or both?
14. How will seed be stored: in bags, in bulk, or both?
15. What allied lines can be handled?

Types.

Potential value.

16. Is suitable labor easily available? Are wages high enough to place added emphasis on labor-saving machinery?

Selecting Processing Equipment

Once the decision to build a new processing plant has been made, the necessary processing and handling equipment must be selected. Factors influencing the selection of equipment are:

1. Selecting cleaning machines:

- A. All factors affecting the decision to build a plant will have a bearing on machinery selection.
- B. Crops to be handled will affect equipment selection. Different crops often require different machines to bring the seed up to desired standards.
- C. The weeds commonly found in the area and in the crop seed must be considered. Different machines are needed to remove different weed seed.
- D. The volume or capacity desired will determine the size and number of machines needed.

2. Elevators and conveyors:

- A. Elevators must have a capacity large enough to run the machines at maximum capacity. They must also be able to fill the bins quickly, releasing plant workers attending them for other duties.
- B. There must be enough elevators and conveyors to move seed to all points where seed must be moved from machine to machine, or machine to bin, etc. Mechanical seed handling gives higher capacity and lower cost than moving seed by hand.
- C. The type of seed to be handled will affect the choice of elevators and conveyors. Easily-damaged seed limit the choice of handling equipment; certified seed would also limit handling equipment to types that can be cleaned out easily.
- D. The type of plant layout--vertical or horizontal machine arrangements--will affect the selection of elevators and conveyors.

3. Bins and hoppers:

A bin or hopper should be used over each machine, and at the sacking

off point. Bins should be large enough to feed the machine without continuous supervision or feeding by a man and they should also be large enough to compensate for "surge," or differences in operating capacity between two machines.

Planning the Plant Layout

Efficient arrangement of machines in the cleaning line can greatly reduce the cost of processing seed, as well as increase cleaning capacity. Seed plant layout varies according to the crops handled and the elevator system used. But, complete processing of any seed would follow through most of these steps:

1. RECEIVING involves putting seed into the cleaning line or into bulk storage where they can be held for later cleaning.
2. BULK STORAGE is found in larger plants. Bins or tanks hold seed until they can be cleaned. These are usually designed to move seed directly into the cleaning line. Bulk storage in "tote-boxes" is also widely used.
3. CONDITIONING OR PRECLEANING scalps off large chaff, removes awns, beards, or hulls. Conditioned seed flow through the cleaning line easier.
4. CLEANING removes inert materials, broken seed, weed seed and other crop seed. The air-screen cleaner is generally considered the basic seed cleaner.
5. SEPARATING AND UPGRADING: Basic cleaning may not remove weed seed or immature crop seed present in a seed lot. The roll mill, spiral separator, gravity separator, and other machines use certain physical characteristics of seed to make separations. The gravity separator and stoner can also be called upgrading machines; they remove poor quality seed, sand and stones to increase purity and germination.
6. TREATING AND BAGGING complete processing. A chemical to control diseases or insects is applied to many seed. The seed are then weighed into bags or other packages.
7. FOR STORAGE AND SHIPPING, the modern trend is pallets for bagged seed and palletized boxes for bulk seed. These can be moved very rapidly by one man with a forklift.

Layout of the flow pattern and design of the processing plant will be affected by all considerations in the decision to build a plant, as well as the factors

affecting the choice of machinery. In general, equipment must be arranged to provide:

1. A cleaning sequence that is proper, complete, and as simple as possible.
2. The most economical distribution and maintenance of space.
3. An orderly and continuous flow of seed and waste products, with a minimum labor requirement.
4. Maximum flexibility to handle different seed which require different processing.
5. Allowance for orderly expansion as capacity needs increase.
6. Maximum safety and comfort of operating personnel.
7. Effective and economical means of handling waste products.

Processors have developed two main systems of seed plant design in their efforts to lower processing and handling costs. These are the multi-story and the single-story plants.

Multi-Story Plants

The multi-story operation has been a long-time favorite. Seed are carried by elevators to the top floor and emptied into large bins. Cleaning machines are placed in a vertical series on lower floors. Seed flow from one machine down into the next by gravity. Seed complete their trip and are bagged off on the bottom floor, and moved to the warehouse.

Multi-story processing plants clean a wide range of seed in many seed-producing areas. The minimum expense for elevating equipment is their big advantage, since seed flow is largely by gravity. This system is frequently used with grain elevators where necessary building height is already available.

Single-Story Plants

Many plants are being built with all cleaning machines mounted on a single level, or on platforms on the same floor. Single-story plants are gaining in popularity, especially in the last few years when great strides have been made in elevating and conveying equipment.

In the single-story plant, seed are moved from one machine to the next by elevators placed between the machines. More outlay for elevating equipment

is necessary, since a separate elevator is needed to feed each machine. But, supporters of this system are quick to point out that building costs are much less. A single-story building costs less than a multi-story building sufficiently reinforced to carry the weight of machines and seed bins. One man can supervise a single-level processing line without running up and down stairs. Conveyors are often used in addition to elevators to move seed horizontally in this system.

Layout Variations

Variation of the single-level plant, or combinations of part multiple- and part single-level arrangements, are perhaps more popular than either system. A popular arrangement places the air-screen machine on an upper level, while all other machines are on a single level below the air-screen cleaner. Another common variation of the single-level plant is the mounting of two or more machines which make similar separations in a vertical series. This system is popular with hybrid corn seed processors. The debearder is often mounted over the bin serving the air-screen cleaner at the head of the cleaning line, even when other machines are on a single level.

Processing Cost Factors

The per-bushel or per-pound cost of processing seed varies widely from plant to plant, since volume, as well as many of the cost factors, vary widely.

Some of the factors which must be considered in determining the cost of processing seed are:

1. Salaries and Labor:

In addition to the basic salaries and wages of the manager, secretaries, mill workers, truck drivers, etc., most organizations allow from 15 to 20% additional for fringe benefits such as vacations, holidays, labor tax, labor insurance, hospitalization, etc.

2. Supplies, including:

- A. Bags
- B. Bulk boxes
- C. Treating materials
- D. Tags
- E. Twine
- F. Bag stencils

3. Building, including warehouse, processing plant, and other buildings used in the operation:

- A. Upkeep and repairs
 - B. Insurance
 - C. Depreciation
 - D. Heat
 - E. Electricity
4. Processing and Handling equipment:
- A. Depreciation
 - B. Upkeep and repairs
 - C. Insurance
 - D. Electricity
 - E. Gasoline and oil for lift trucks
5. Other processing and handling costs:
- A. Insurance on inventory.
 - B. Taxes on inventory.
 - C. Transportation costs for moving seed from country points to the processing plant.
 - D. Loss of seed stocks.
 - E. Handling and disposing of screenings.
 - F. Quality control costs, including purity and germination tests.
 - G. Certification costs, including new bags, tags, plant cleanup, separate lot handling, etc.
 - H. Record-keeping.
 - I. Warehouse handling and shipping costs.
 - J. Other items, such as insect and rodent control.
 - K. Truck purchase, maintenance and operation
6. General Expenses:
- A. Interest on investment
 - B. Taxes on property
 - C. Advertising and promotion
 - D. General overhead

These costs must be covered by custom processors in the processing charge. If the processor buys field-run seed and markets the finished product, his price margins can absorb some of the costs listed above. However, buying and selling involves additional risks and costs, including:

1. Additional salaries, expenses, etc., involved in marketing.
2. Additional advertising costs.
3. Losses due to seed deterioration during storage and marketing.

4. Screenings lost.
5. Expenses involved in carrying accounts receivable.
6. Shipping costs.
7. Other miscellaneous items.