

IFSCO CONE HANDLING AND DRY KILN SYSTEM

R.W. Bell

International Forest Seed Co.
Birmingham, Alabama

To introduce the International Forest Seed Company (IFSCO) cone handling and dry kiln system, the reasons IFSCO wanted a new drying system must be explored.

First of all, IFSCO was in the forest seed business and dealt in large volumes of southern pine seed. The company had processed as many as 130 000 bushels of cones in one season, so there was a great need for a cone drying system that could handle large volumes economically and that would at the same time ensure the highest seed quality.

Secondly, with source identification of seed lots so very important and with the prospects of custom-processing genetically improved seed, there was a need for a system to retain lot identity. It was determined that the system had to process any size lot without losing identity, and production could not be sacrificed.

The third reason was to improve the economics of operating a cone drying system. The system could not be labor intensive nor could it require large amounts of fuel for operation.

After searching extensively, all these features could not be found in any one existing cone drying system. Most cones were being handled by hand in small burlap bags, which was labor intensive, or they were being handled in bulk quantities, which lost lot identities or seed quality.

As far as cone dry kilns were concerned, none of the existing systems were satisfactory. The tumbler dryer system was locked into small volumes or required pre-drying facilities for cones. The large stationary dry kilns sacrificed lot identity and were very labor intensive. Many of you have probably considered these same areas if you have done cone processing or if you are considering doing it.

After several years of experimenting and testing, the present IFSCO cone drying system was developed. IFSCO is utilizing this system in its plants and several are in operation in the U.S. Forest Service and industry facilities.

The cone container has several features that IFSCO was looking for. It could be handled with a forklift (which cut down on labor), it handled up to a 20 bushel-volume of cones in one container, it provided adequate air circulation for the cones, and the crate cost was economical.

As for the operating features of the dry kiln, several are important to IFSCO. First, the unit has a thermostatically controlled temperature system. It can hold a constant drying temperature throughout the drying cycle, or the temperature can be varied as desired.

Secondly, humidity is monitored constantly during the drying time. Here again, a constant setting can be used, or it can be varied according to environmental conditions.

A third feature is the stackable tray. Each tray is individually handled with a capacity of six bushels of unopened cones. Trays can be stacked six high, and any tray can be individually inspected during the drying process. The tray is constructed primarily of wooden parts, which helps in insulation during drying. Tray bottoms are constructed from perforated metal.

A water injection system is another feature. This system is used when there may be unusual cone characteristics or circumstances that would require moisture to be applied to cones after they are in the trays. Water can be added to the cones after they have been dried, and the cones will close back to nearly the original size. This is helpful in the southern U.S. in opening early-picked cones.

Another feature of the system is the unique heated air recirculation system. The air passes through the cones and by a ductwork system is recirculated to the heating system. The air is automatically monitored for humidity, and optimum use is made of its moisture absorption capacity. When the air becomes saturated with moisture, shutters automatically open, moist air is expelled, and dryer air is taken in.

Fuel consumption is another important feature. Natural gas, propane gas, or fuel oil can be used; however, natural gas or propane gas is recommended since it tends to burn cleaner. By recirculation, the fuel consumption has been reduced by approximately 60% over conventional noncirculating systems.

Portability of the system is also a benefit. The entire dry kiln can be loaded on flatbed trucks and transported wherever necessary. The system is never tied to a permanent location.

The following is a description of how the cone handling and drying system works. Figure 1 shows the flow process for the system; however, you must keep in mind that these procedures may be varied to suit different conditions.

To operate the system, a 2500-pound lift capacity electric forklift is used. This machine is equipped with a special rotating fork positioning attachment. The special use of this attachment can be seen as the dry kiln operation is explained. The attachment can be mounted on most any forklift with the addition of hydraulic valves to handle operation.

The cones are gathered from either seed orchards or natural stands. They are put into the 20-bushel crates in the field and are transported to IFSCO plants by flatbed trucks. As cones are received at IFSCO plants, they are stored in open field conditions. They are held there to complete the after-ripening process, which allows the seed to mature. This requires approximately 5 weeks from harvest.

The cones are then dumped into a hopper by forklift with the special rotating fork. This hopper has a capacity of 225 bushels.

To fill the dry kiln unit initially, trays are filled individually as they are removed from the dry kiln. Each tray receives approximately six bushels of cones, allowing room for expansion and proper air circulation.

After the cones have been dried properly, the unit can be emptied. Trays containing dried cones are removed from the unit and the cones are dumped into a hopper. This hopper feeds the cone tumbler, which extracts the seed from the cone.

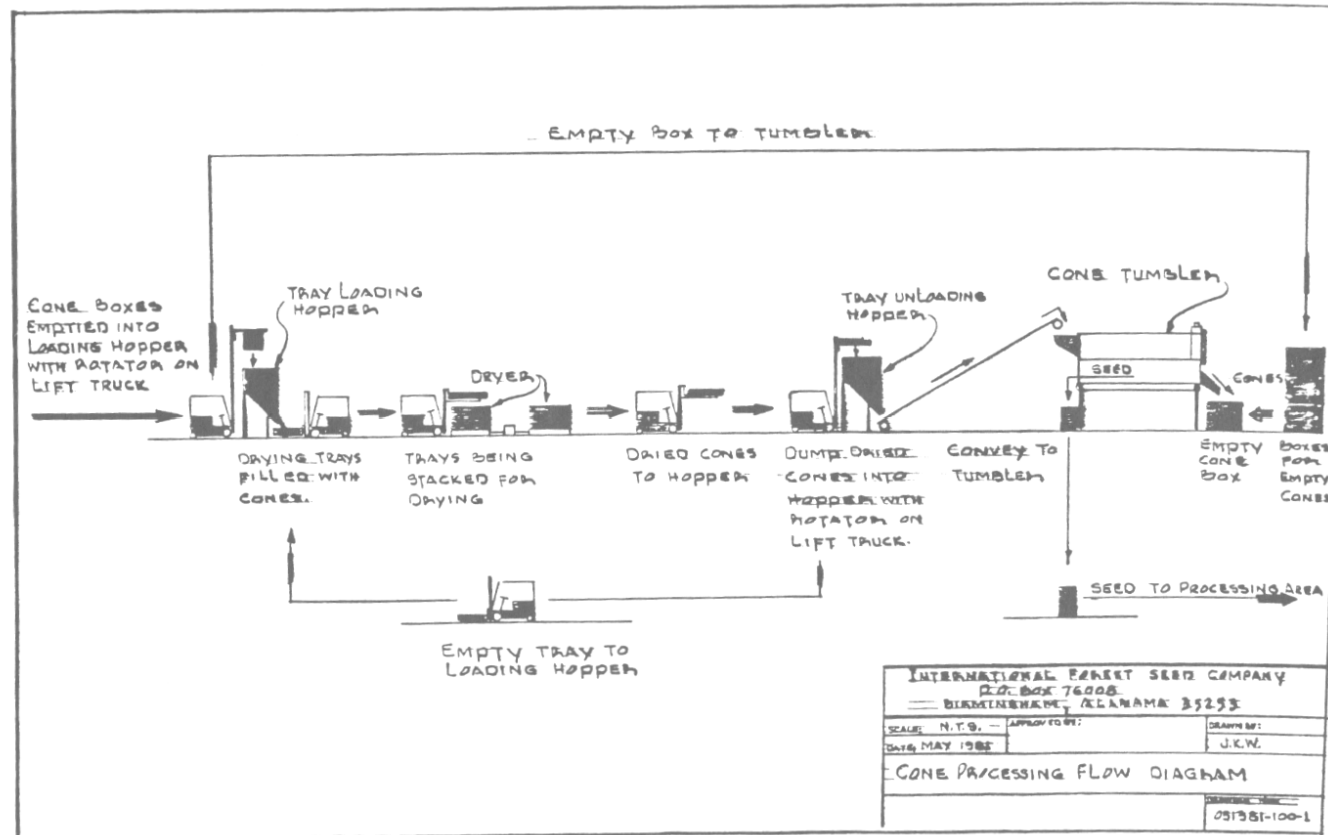


Figure 1. IFSCO cone handling and drying system.

After a tray is emptied, it is returned to the filling hopper to be refilled. The tray is then stacked back on the dry kiln, and a constant emptying and filling is continued until the unit is completely emptied and refilled.

A complete unit can be emptied and filled in 4 hours using two men and one forklift. This is a volume of 288 bushels of cones, and this volume can be maintained with four to five lot changes.

As for specifics on the drying of cones, IFSCO uses a setting of 110°F or 43°C, which is constant throughout the drying cycle. The humidity dial is normally set for 45%, but this can be varied as needed. Due to the moist conditions of our cones, the humidity remains high enough to keep the shutters open continuously the first 4 or 5 hours and then they open or close as needed. The cones of the species of southern pines that IFSCO deals with are normally dried in 32 to 48 hours.

At these rates of production, 10 000 bushels of cones per dry kiln can be processed in one season. This could vary with different species of cones and different time limits on processing.

The space required for the unit and its operation is 32 feet by 55 feet. This allows 15 feet on each side of the unit for forklift operating space. The unit should be housed in an enclosed or at least a covered building for operation.

Also, to meet some specialized needs, IFSCO designed a hand-operated dry kiln. This unit is also recirculating but it is made for areas where forklifts are not available. The unit has only half the capacity of our standard dry kiln and is considered primarily for special use projects.