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Trouble Shooting in Seed Processing

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TROUBLE SHOOTING IN SEED PROCESSING

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In these days of rising costs, higher taxes, less work, and more play, the seedsman still has to keep his nose to the grindstone. He continues to perpetuate, nourish, protect, and try to improve those God given life forces in our cultivated crops from generation to generation. But ballooning inventory values and rising interest rates seem to act as a giant magnifying glass to make major troubles today out of yesterday's irritations. Those of us in seed processing can help out by shooting down some of the troubles which creep up in our areas of activity. I am going to analyse the steps in a procedure for trouble-shooting and give you a few examples in which these steps have been helpful to us. I hope that you will find one or two points which will be helpful in your "trouble-shooting" activities.

"TROUBLE-SHOOTING" DEFINED

To me "trouble" is some adverse deviation from a desirable standard condition. "Shooting" implies aiming at, firing at, and hitting some adverse target. So in business "trouble shooting" can be defined as the activity of detecting and correcting adverse deviations from standard conditions. The owner himself or the manager may be a troubleshooter; or he may assign this task to others. A process engineer spends a lot of time troubleshooting. Troubleshooting is one type of hunting in which the weapons do not have to be registered.

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PROCEDURE

I shall discuss four major steps in troubleshooting: (1) set standard, (2) detect variations from standard, (3) make corrections, and (4) follow through. Let's analyse each step in more detail.

Set Standard:

Important standards in processing relate to quality of product, safety of operating personnel, and profit. All of these standards are components of larger goals set by the management of the company or organization. For example, a standard operating air temperature of 105°F. in seed drying is a step toward achieving a quality of higher than 95% germination for the final product. A desired maximum number of lost-time hours per thousand man-hours worked in a department is a standard related to an overall company goal of having a safe place to work. Budgets and standard costs are standards related to the overall goal of company profit as set by management. It is important to know these standards, to know how and why they were set, and to know how the standards are related to the overall company goals. A good trouble-shooter is goal-oriented. The three areas mentioned: Quality of product, safety, and profit, relate to the interests of three important groups: customers, fellow employees, and stockholders.

In setting standards, it is important to use numbers to the greatest practical extent.

Detect Variations from Standard:

Variations from standard may be detected from many sources.

Lab reports: Most seed companies have routine procedures for sampling and testing each lot of seed and reporting the results to a designated person of authority. Variations from standard should be reported immediately (verbal or phone) by the laboratory supervisor prior to typing or mailing of reports.

Complaints: Customer complaints generally are reported to the Sales Department. Sales Managers have a natural instinct to hide or delay these reports. However, a customer who complains must be considered a friend of the company or industry. For every customer who complains, there are ten customers who say nothing but buy elsewhere. A complaint is an asset to a good troubleshooter. A little technical service may be all that is needed but the complaint may be a symptom of more serious trouble.

Inventory Reports: These reports in finished form generally come to a sales and/or accounting department. Over-production of a size or type of seed will show up here.

Insurance and Accident Reports: The reports by outside persons are valuable sources of information on potential hazards to operation and employee safety.

Budgets and Cost Reports: These reports are most valuable if prepared rapidly (by the 10th of the following month) and in such a form to show variances from standard. Monthly variations of, say, $500 or 5%, whichever is greater, should be forcefully analyzed.

Plant Tours: A visual inspection on a periodic schedule basis will do a great deal to supplement written or verbal reports.

Verbal Reports: Meetings for discussion of operations with groups and/or informally with individuals can reveal unwritten variations from standard.

Two important features in detecting variations from standard should be stressed: (1) speed of detection (try to recognize variations before formal reports are issued) and (2) reliability of information (check or verify all reports).

Make Corrections:

There are several important points to consider in making corrections in variations from standard. Goal orientation should be kept in mind at all times. Correct as fast as possible.

Define Problem: A clear-cut numerical statement of the degree, nature, and desired result is over half the battle.

Data-Data: Get as much information as time allows. Usually, the facts will describe the solution. There is a lot of just plain work here.

Solutions-Innovations: Solutions usually can be obtained from your own personnel. Operators close to the problem usually know the solution if they have experienced the same problem before. If it is a new problem, try your own resources first-operators, managers, yourself-then go to your friends: (1) equipment or material suppliers (the seed industry is blessed with talent), (2) your trade association (the seed industry again is above average), and (3) universities (maybe try them first!). Give full and honest credit to the originators of solutions to problems - janitor, operator, president, or yourself.

Economic Studies: A solution usually will require investment of money and you must be able to relate this investment to your company's profit goals. Compare alternative solutions using economics. Most seed companies will have a method for economic evaluation: payout time, rate of return, present worth, etc. A good troubleshooter must know these statements:

1. Participation of operating personnel in the design of systems or procedures for correction of deviations in their departments will enhance success of the intended correction.

2. Full answer to the question "Why?" by an operator will insure cooperation by the operator in his participation to the correction of a deviation.

Sell-Spaced Repitition - A processing man usually does not consider himself to be a selling man. However, when an innovation is involved for making corrections, the process man must sell. Particularly if large investments or new methods are involved, he must sell.

The technique in selling of spaced repitition usually will be successful. This, simply, means stating the solution-pausing for a time (days)-stating the solution-pausing, etc. This cycle generally must be repeated six times for success. The first response is negative and subsequent responses become more positive until success is realized. Successful troubleshooting requires selling of ideas.

Proposals: After the operating personnel are sold on an innovative correction (or any correction to a variation), formal proposals in the form of recommended changes in procedure or proposals for capital investment can be made. Most companies will have some procedure to follow.

Reduce to Practice: After the foregoing procedures, this step will seem inconsequential, or ordinary, but it is, of course, the the main step. The point is that the foregoing steps have reduced the chance of failure of our solution. These previous steps have, in fact, insured the success of our venture in trouble-shooting. If new equipment is installed or new procedures adopted, the operators will make it work!

Follow Through:

After corrections have been made, it is necessary for the troubleshooter to follow-through for a period of time (usually one year) to validate the solution.

Laboratory reports of routine analyses will indicate success of the changes.

Meetings of staff and management personnel will indicate their opinion of the degree of success of the solution.

Cost reports will clearly give a "post-audit" of the project.

In all cases, teamwork of all affected personnel has been responsible for the success of the "trouble-shooter's" work.

Frequently, new projects will be developed from certain required corrections or changes. Thus, the cycle of improvement of conditions to meet company goals is extended.

EXAMPLES

And now, let's examine some practical examples of "trouble-shooting" in seed processing.

A list of processing steps reveals many chances for damaging seed. Seed companies exert maximum effort to hold damage at a low level in each step.

Shelling:

Damage in shelling may be held to a minimum in impact shellers by shelling at the proper moisture content, by holding speed down to a practical minimum, and by adequate feed rate.

Development of a production-line sheller which would approach hand shelling with a minimum of crown damage would appear to be a desirable goal.

We have been attempting to develop a method for measuring seed damage which would in some way relate to the vigor of the seed or show the effect of damage on vigor. GADA and TZ tests on seed hand shelled and machine shelled showed no significant difference. However, by applying stress of heat and humidity to the seed and comparing vigor readings before and after stress we began to see differences in samples shelled by different methods. We are still trying to develop this method. We call it the "vigor-index", or Funk "vigor index." (Figure 2)

In effect, we have borrowed the accelerated aging test (presented here at the Short Course) and substituted the germinations before and after stress with vigor measurements (GADA or TZ).

I would like to show you some of the preliminary work we have done with this test. We still have a long way to go. We have constructed an experimental sheller in which we attempt to simulate hand shelling mechanically. Perliminary results are promising but we have not established capacity factors yet.

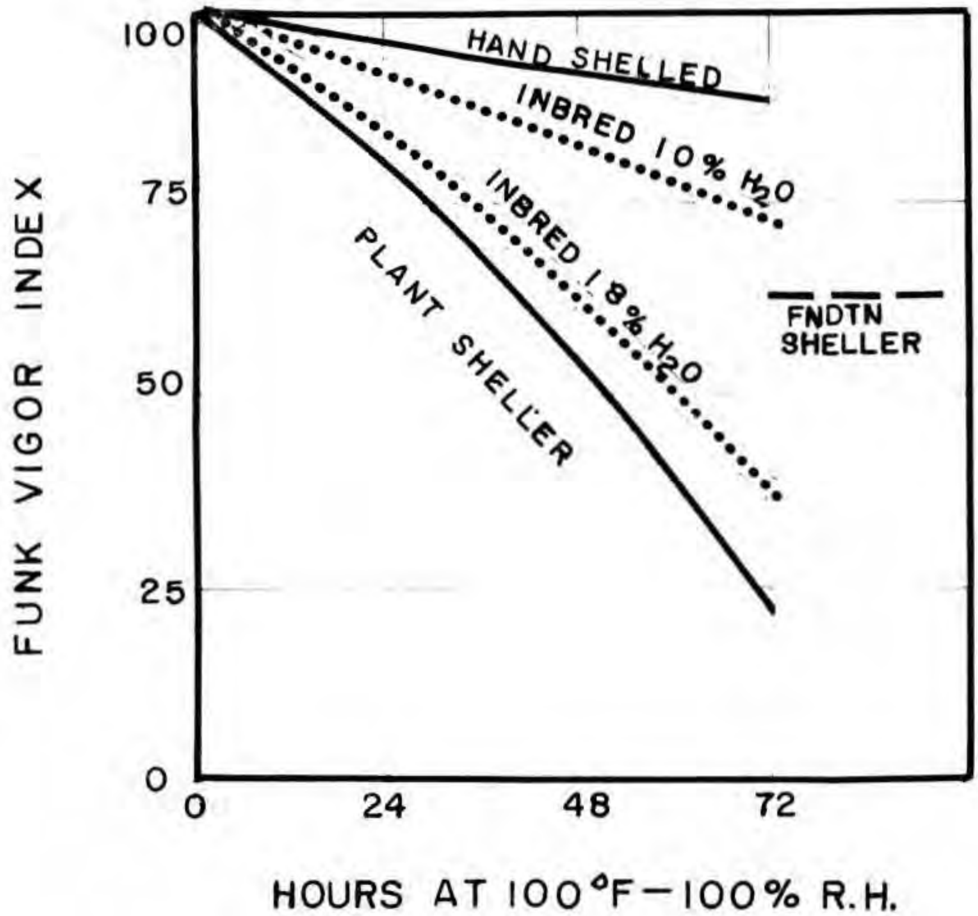

Figure 2. Effect of shelling methods on Funk vigor index (initial GADA ÷ final GADA x 100).

The example is given merely to show a case of attempting to set a standard (hand shelling) and establishing some method of measuring deviations from standard (vigor-index) which relate to effect of damage on seed vigor, and attempting to make corrections with a new sheller design.

Storage:

A certain percentage of seed stored in a warehouse will deteriorate so that germination falls below a desired standard, such as 95%. This effect is detected by routine or periodic sampling of the inventory. Discard of this seed constitutes an economic loss to the seed company.

Inspection of the equilibrium moisture content chart for corn reveals how changes in temperature and relative humidity in the warehouse can cause raising and lowering of the moisture content of corn. (Figure 1)

Frequently it is possible to justify capital expenditure for equipment to control the atmosphere in a seed warehouse by lowering the amount of discards due to low germination; each seedsman must, of course, consider his own conditions, area of country, etc., but rising costs of seed in storage has been a factor justifying control where perhaps this expenditure could not have been justified at lower values of inventory.

Pallets:

Setting standards of labor usage in warehousing and shipping has led many companies to the use of pallets and fork lift trucks in place of the more costly hand-stacking methods.

In three warehouses, we purchased enough pallets to "pilot-plant" the use of pallets to demonstrate the advantages and to obtain data with which to justify further conversion to fork trucks and pallets. In this way, the plant supervisory personnel participated in the project by having their own experience to use in estimating cost savings and other benefits.

After converting to pallets, we obtained monthly reports from the plants to determine if anticipated savings were actually being realized.

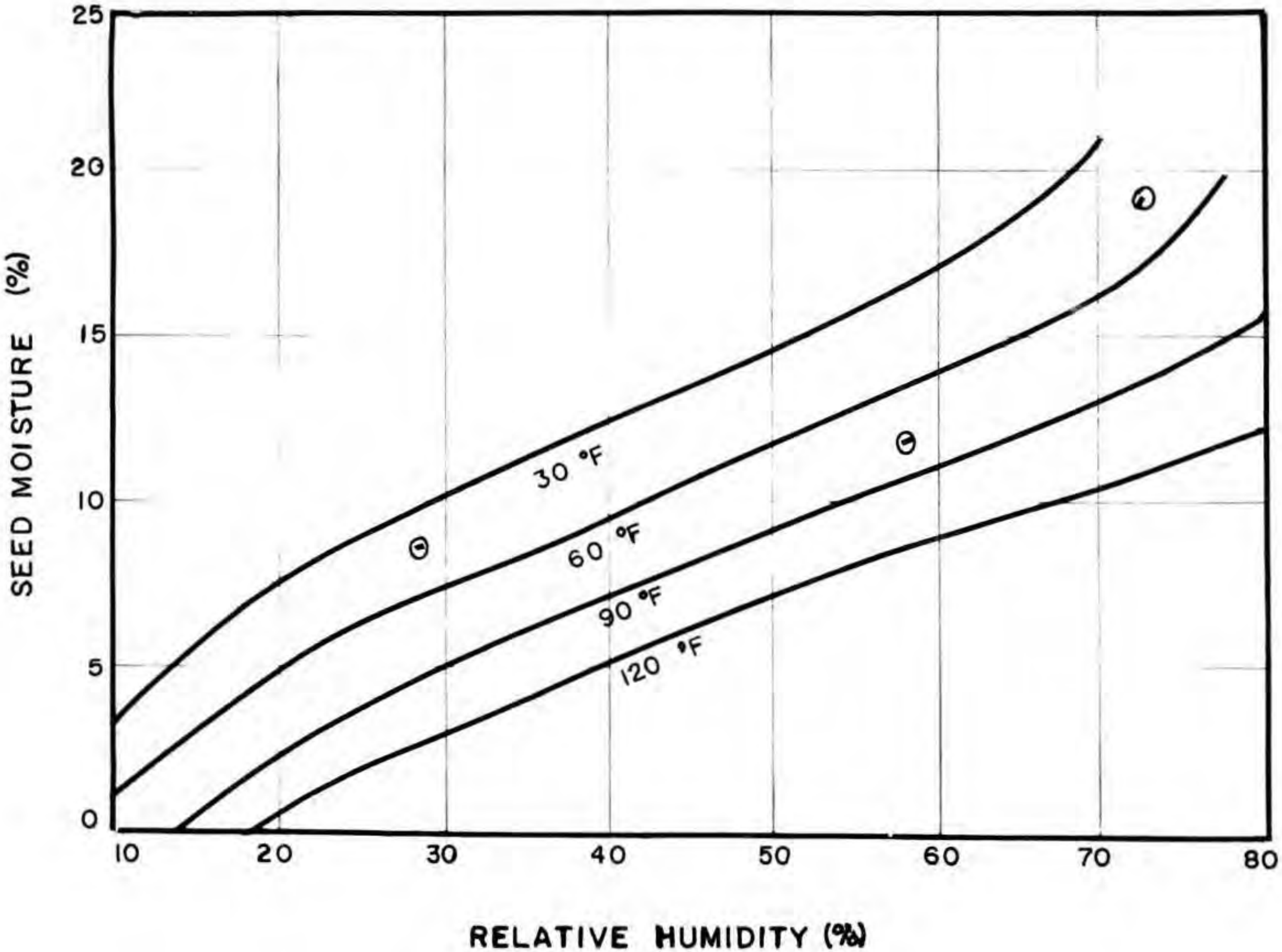

Figure 1. Equilibrium moisture content - corn.

Sales-Capacity Balance:

Setting standard desirable ratios of dryer capacity, storage capacity, and processing capacity to expected sales from a plant can be helpful. Comparing these standard ratios with actual capacities at existing plants reveals bottlenecks or critical areas and is helpful in planning.

Economic studies will show the desirability of correcting these variations, usually by new construction, as shown by this project now underway in Canada for added drying and warehouse capacity.

Planter Plates:

An outstanding job of troubleshooting has been done by the ASTA Machinery Committee in working with the implement manufacturers and seed companies in guiding the development and testing of planter plates and following through year after year to improve plates for the many odd kernel sizes and shapes.

Foundation Seed Corn Dryer:

Our Foundation Seed personnel assigned us the task of designing and building for them a dryer system so that they could load the dryer bins in the seed-corn field and reduce damage. In this example they were attempting to meet new operating cost standards and quality standards. After hours and hours of meetings, caluclations, and economic studies, the system finally was proposed, approved, built, and operated with the desired results. The photos will tell the story briefly.

Air Pollution Control:

In this example, our standard for emission was set by the State of Illinois. Their formula for allowable emission is based on process weight rate as shown on the curve. (Figure 3)

Our job was to determine our deviation from their standard. We made material balances around whole plants by sampling process streams and making measurements as required. Emission was calculated in this way. Examples are shown in the slides. In every case our estimated emission rates were within allowable limits.

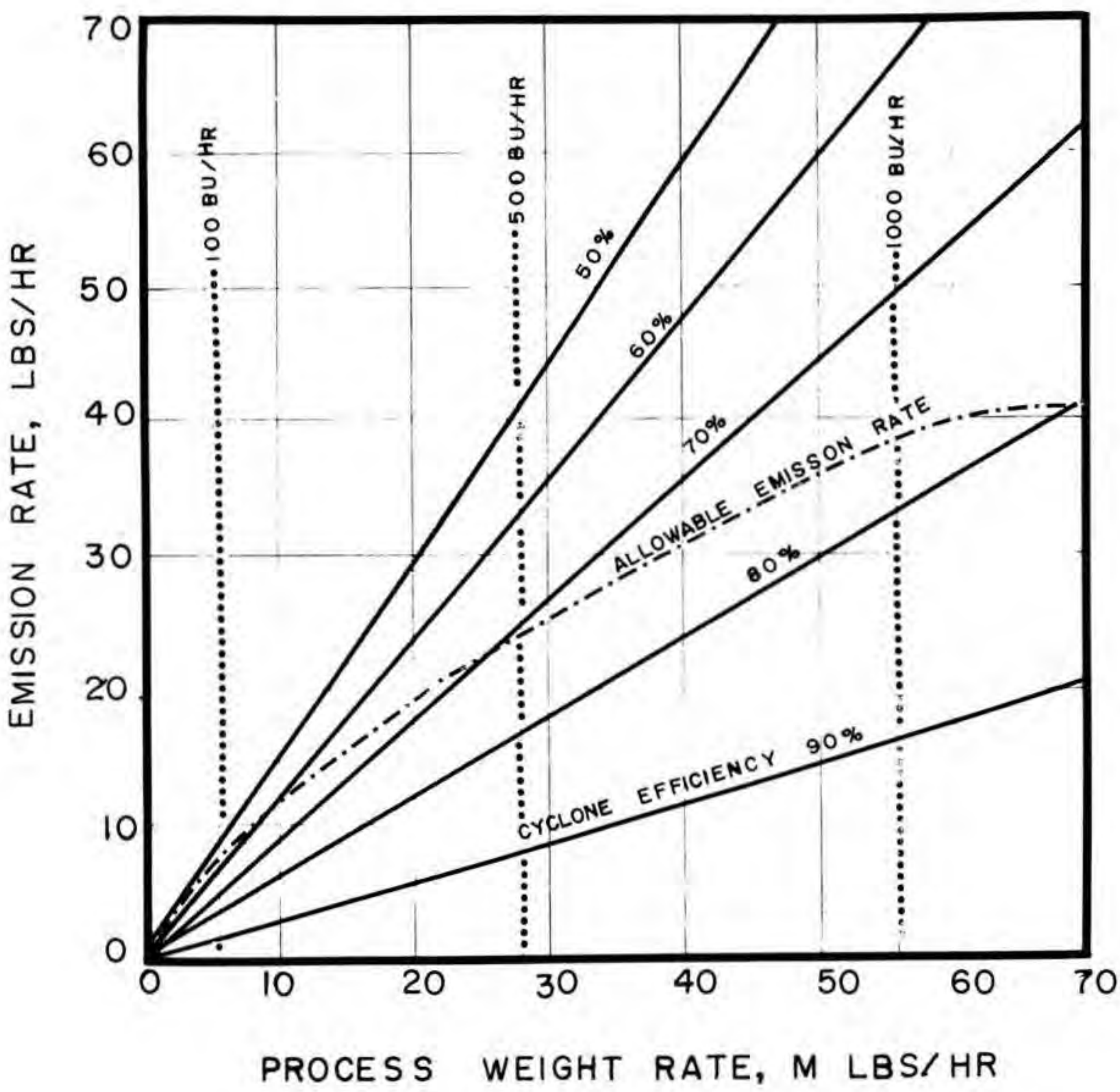

Figure 3. Effect of cyclone efficiency on calculated rates of emission and comparison with allowable emission rates (state of Illinois Rules and Regulations, March 30, 1967).

So no corrections were necessary. We followed through by reporting to the State Board, as required by law.

This study revealed two principle points: (1) generally a seed processor in Illinois can achieve satisfactory results by properly designed cyclone dust collectors, as shown here; also, (2) the seed industry is quite different from the grain handlers in process weight rate and cleanliness of input seed.

CONCLUSION

I am sure you can describe many examples of successful troubleshooting from your own experience. In the examples I have given, I am sure you have noticed most of the four steps shown here: (1) Set Standard, (2) Detect Variations from Standard, (3) Make Corrections, and (4) Follow Through.

I hope this formula will some day be helpful to you in "trouble-shooting" your way out of a tight spot. Thank you.