TSGC INC

Tri-States Grain Conditioning, Inc.

THE IMPORTANCE OF GRAIN TEMPERATURE DETECTION

Temperature is the key to safe grain storage. When grain goes out of condition, regardless of the cause, there is always an unusual increase in temperature. Temperature is the only truly accurate indicator of grain quality for those who manage grain.

Knowledge of the causes of deterioration and spoilage in grain is essential to the grain manager. Although more is yet to be learned, grain workers and scientific researchers have jointly given much sound information with which to work.

To point out the uses of a grain temperature system, we will discuss various applications of temperature information.

Grain is a living organism. Like other living things, it breathes (respires) and it may become sick. Excessive moisture, high temperature, and poor grain condition (damaged kernels) are generally considered the most important factors that lead to trouble in stored grain.

The use of moisture tests in receiving grain is an indication of the great importance given moisture as a criterion for storage ability. Some tend to over-emphasize moisture content to the exclusion of all other factors, but low moisture content is not enough to ensure trouble-free storage. In fact, deterioration from excessive moisture can occur in grain which is placed in storage at a uniform moisture content below that considered safe for long term storage. Temperature and atmospheric changes can cause certain areas within a mass of stored grain to rise in moisture above the critical safe moisture level.

Temperature importance is best indicated by the use of refrigeration to keep foodstuffs, and by the tendency of high temperatures to speed most chemical reactions.

Grain condition refers to the soundness of grain. It has been demonstrated that unsound grain (grain with a high percentage of damaged kernels, greater number of microorganisms, and with deteriorative chemical changes) is much more likely to heat in storage than sound grain of the same moisture content. Both grain respiration and the growth of microorganisms are thought to be affected when grain is unsound.

Now let us examine the causes of heating, and determine their relationship to grain deterioration and spoilage.

The three specific causes of heating that are of interest to you are:

1. **respiration of the grain itself (metabolism of viable grain)**
2. **microflora (microorganisms such as fungi and bacteria)**
3. **insect infestation.**

All three contribute to total respiration and heat production below 135° F. One type of heating alone can cause trouble, but one type of heating can also serve to trigger another problem which will contribute to total heat production.

Grain respiration increases as the moisture content of grain increases. This increase is gradual until a critical moisture content is passed. Respiration then increases faster than the heat of respiration can be dissipated. This will cause a marked temperature rise, but corrections are possible before damage is done; i.e. aerate, turn, or dry. This condition will occur in grain of relatively high moisture content and in cases of moisture translocation.

The increased temperatures are likely to excite the other two causes of heating. When grain respiration alone is the cause of heating, visual inspection of the trouble area, while turning, will show little evidence of cause. If moisture translocation has brought about the increased rate of respiration of the grain, aeration can be employed to correct the situation.

If the moisture content of the entire lot of grain approaches or exceeds the critical limit, and if grain drying equipment is available, drying is advisable, especially as a precaution against future problems.

The important thing for us to note about microorganisms is the fact that they respire and tend to increase the rate of respiration of the grain. Thus a rise in temperature can mean microorganism growth. If the temperatures of the grain mass are low, such growth can be slow and temperature rises relatively small.

Slowly rising temperatures warrant investigation of the causes. When indications appear, look closely for growth of microorganisms as you inspect your grain.

During the last 70 years, many factors have made accurate temperature knowledge even more important than before. For example:

1. Grain is stored longer and in larger bins, making the risk in holding it greater.

2. Damage from insect infestation is great.

3. Grain is harvested and often stored when it has high moisture content.

4. There is a greater demand for top quality grain.

5. The cost of handling and moving grain has increased. It costs from 2-1/2 to 5 cents per bushel to move grain. Accurate temperature information allows an operator to turn his grain only when it must be turned.

6. Buyers today want assurance that grain purchased is of uniform quality throughout. Unless a grain manager has temperature records, one cannot be certain of the condition of purchased grain.

7. With the use of aeration systems, temperature knowledge is essential. The grain manager must know if and when hot spots are forming before the aeration system can do a thorough and economical job.

These are the reasons why temperature information is important to a modern cost-conscious grain manager. No matter what type of grain is stored, the same basic principle holds true: **You must know the temperature of your grain to know the condition of your grain.** It is imperative that the grain manager has accurate, complete, and up-to-date temperature information for good grain management. Monitoring the temperature of grain on a regular basis gives the manager the best chance to make a correction when a temperature change is occurring. Knowing the temperature of the grain makes it possible for the fans to be run only when they are needed, saving money in utilities.

Now, there are several ways to obtain this temperature. 1) You could use the "**Feel and Smell**" method. All that is required here is for the grain manager to feel the side of his bin and smell inside the bin in an attempt to detect heating. Another variation of this method is while turning the grain, it is felt, smelled, and/or visually inspected on a belt or at a spout outlet to detect heating. Obviously, this method has its drawbacks, due to the limited knowledge these observations will bring.

2) The "**Thermometer Method**" is another way to read temperatures. With this method, pipes are inserted into the grain mass and a thermometer lowered into them. After a time, the thermometer is raised and the temperature read for that point. This method also has several serious drawbacks. 1) It is very time consuming. (A thermometer is not designed to furnish quick readings). 2) It must also pass through grain temperatures which are above or below that which is to be measured. 3) It must be read very quickly once it is withdrawn from the pipe, and often in a poorly-lit area, making fast, accurate readings nearly impossible. 4) In addition, currents are set up inside the pipe itself which may affect the readings. Although much better than the "feel and smell" method, the thermometer leaves much to be desired in all phases of accuracy, dependability and speed of obtaining temperatures.

3) A third concept is the **thermocouple cable method**. A thermocouple is nothing more than two dissimilar metals soldered together to make a heat sensing point. TSGC, Inc cables have thermocouples made of copper and constantan (an alloy of copper and nickel), the most sensitive combination made for grain bin temperature scanning systems.

Thermocouples are the most widely used temperature sensor for several reasons. 1) They are rugged, low-cost, dependable, and accurate. 2) The measurement is a point measurement with fairly quick response to temperature change. 3) Watching the trend (changes) of the temperatures provides a clear indication of unusual temperature activity.

We will repeat again the paragraph we began with: ***Temperature is the key to safe grain storage and quality grain. When grain goes out of condition, regardless of the cause, there is always an unusual increase in temperature. Temperature is the only truly accurate indicator of grain quality for those who manage grain.***

TSGC, Inc. is one of the largest suppliers of grain temperature monitoring equipment in the world. Headquartered in America's Heartland, our administration, fabricating, sales and service divisions are located in Spirit Lake, Iowa. We have an extensive network of contractors representing our products and services nationwide and in over forty countries. ***TSGC, Inc. is dedicated to serving you.***

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