

Management and Traceability Software for Bulk Commodities

David Trueman

Abstract

David Trueman will present and discuss his company's experience in the practical application of Management and Traceability Software in Grain Elevators. Illustrated by projects in large scale international food and feed facilities, he will explain the benefits of CommTrac, a unique software solution.

Particular points of emphasis will be how to deal with a large variety of bulk commodities, avoiding inadvertent mixing; how to protect quality grain throughout its movement through an elevator; overcoming the inherent "lack of ownership" problem and how to manage blending. His experience in providing workable processes for the weakest part of the traceability chain, that is bin to or from ship, rail car, barge or truck will be discussed. David will proceed to show techniques for limiting batch sizes, optimising FIFO and the role of verification of executed procedures through electronic signatures.

In addition to this, he will describe the "ideal elevator" – for new facilities, and considerations that should be made for its optimisation.

Bulk grain business...

The increasing demands placed upon the bulk grain industry by regulatory controls, the constant requirement for competitive advantage and the need for business differentiation have placed special and new demands upon bulk grain handling. It is here, at the start of the food supply chain, where basic products are handled in bulk that segregation and traceability is important. The basic problem with handling and tracking bulk is that by definition there are no labels, no bags and (in the main) no containers. If speciality, premium price grains are to be handled then extra care has to be taken to protect and preserve identity. One simple human error can completely erode any price differential.

What needs to be done?

In some way the bulk commodity has to be kept in defined lots, mixed if they are the same or mixed if a controlled blend is needed, segregated if grade quality has to be protected. Things have to be both controlled and monitored, this needs data.

Data has to be acquired. Data that will show what is happening and data that will show what has to be done. Data can come from a facility, whether from automatic operations or simple manual actions, this data has to be entered to a database, this can be a paper-based record system in theory, but this will not deliver the benefits that are discussed later. The data that is obtained will relate to the grain that is being handled, the equipment that is used, the people that are involved and the commercial transactions that are made.

The nature of data...

In principle there are two types of data; one that represents what should have happened (the plan) and another that represents what really happened (the actuality). It is clear that true traceability, segregation and accurate, optimized blending can only be done from the latter. This is called real-time data. Real-time data has a date & time stamp on each record. When the data is later converted to information for reports, the date & time stamp ensures that the report is compiled from data in the correct chronological order – that is, the report means what it is saying.

Information

When data is reported it becomes information. When a grain handling facility has data acquired from it, then the following becomes available, in many cases fully automatically:

- Traceability
- BioTerrorism Response Act compliance
- HACCP adherence
- Accreditation audit trail
- Best practice for operation and management

Data from where?

One of the apparently “smart and flippant” answers to this question is “everywhere”. In fact this is a good maxim. The more *good* data that is acquired the more complete the business and operational picture will be. In practice the data in a bulk handling facility will relate to:

- Product reception, that is trucks arriving and offloading grain
- Truck-scale data, allowing all arriving loads to be identified, and have identity
- Laboratory analysis, that is moisture, protein, damage, lbs per bushel
- Destination location, that is where can we and are we going to put the load
- Routing control and recording of routes, that is which “path” through the facility is to be and was used
- Process control data, to provide storage temperature and aeration control values

- Average bin content grade
- Bin segregation control for grain grade preservation
- Discharge control, shipping the correct lot
- “Who, when, where, what” at the discharge point, and truck and railcar identity

Given this rich source of data, much information can be obtained, especially if the data is real-time data. This information is the key to all the business benefits that become possible.

How is data captured?

There is an assumption that nothing can be done with an IT solution unless a facility is fully automated. Although there are many advantages to fully automated operations (elimination of human error and improved throughput), in the real-world we have to use what is provided. Data can readily be obtained from machines that are fitted with an automation controller. The truck scale data can usually also be acquired automatically, as well as from other weigh scales in the system. Where processes are manually done then each action has to be acknowledged, these actions being based upon known (and approved) good practice. One of the key places that data has to be captured is from the laboratory. Sample data can be entered into the database automatically, in the correct chronological order and relating to other data about a particular “lot”. You just need the right software tools, applied in the right way.

Data from manual operations...

For useful data to be acquired from manual operations a structure has to be established for how a particular task is done.

All tasks performed by the facility are controlled and recorded through the use of an electronic “work order module”. At a workstation the operator enters his chosen start and destination for the reception, delivery or internal transfer of commodity. The work order module offers him the most appropriate “route” through the elevator and the start-up sequence for that route. Confirmation that the route has been started is required and at that point the operation is recorded (and made traceable) in the software.

Once an item of conveying equipment is “in use” it will no longer be available for other operations and alternative routes will be offered by the system within the limitations of the facility (based on the process flow model entered at system set up). Conveyors can be “disabled” for maintenance and this “downtime” can also be recorded. In compliance with QA procedures clean downs and flushing procedures are managed by automatically and recorded.

For example: If a conveyor is required to handle Grade 1 soya and its last operation was handling corn the system will request a clean down and inspection. On confirmation that this has been done the conveyor will be re-enabled. The clean down will be recorded along with the name of the inspector. Where an IP commodity is to be handled after a bulk commodity, the system may request flushing of the system and will provide a procedure for this operation.

Access to the system requires a password and various levels of access will be available. This provides a means of limiting and recording operator usage and as such can be used to prove training records are kept up to date. This effectively overcomes mistakes that can be attributed to “lack of ownership”.

Although in simple facilities the number of routes will be small the system will always provide the optimal route and offer alternatives where the optimum is not available.

When the system is configured, routes can be prioritised to take into account many factors including energy usage or minimising the effect on other routes.

Mobile operators...

Many tasks that have to be done in a bulk facility require operators to be mobile; they have to undertake tasks on silo-tops, up ladders and along walkways, away from workstations and other desktop devices. The major deliverable from the new Microsoft[®].net technology is that it allows operators to use simple mobile devices (rugged PDA's) for them to receive work instructions and confirm that the tasks have been done, in real-time. The same technology could be used with other devices for truck and railcar tracking, using satellite broadband.

Correct discharging and bin filling is vital to protecting high grade grain

A “Bin Management Module” provides operators and managers with procedural management, data visibility and traceability for each bin within a facility. Assuming a zero start point all operations feeding or discharging a bin are recorded to provide a real time view of the bin stocks.

Route set up procedures are applied to the truck pit that compare the commodity in the bin to the commodity to be tipped. If there is a discrepancy between commodity types or specifications an alarm is raised to prevent tipping. Identity Preservation can thus be maintained and proven even within a multi-commodity store.

As a bin is filled a record of data relating to each additional truck load is recorded against the bin. Where quality sample data is entered this provides an average across the bin. This data can provide a clearer understanding for blending operations.

A Parent/Child System is used to manage discharge from multiple bins where any bins opened together are grouped into a “Parent Configuration” with each bin being a “Child”. The weight remaining in the parent group is known and once a bin is emptied and zeroed it can be removed from the parent and stand alone.

Each entry into the elevator is time & date stamped therefore a FIFO (First In, First Out) system can be implemented and recorded. Traceability records are available at all times that link back to original scale tickets. Bin emptying is encouraged by displaying the current batch size since the last zeroed point and alarms can be set.

Information, for business and regulatory compliance...

The data within the database can be queried (asked questions of, to make reports); this is where the “data” is “harvested”. Information that is obtained from real-time data can provide “here and now” management decision making tools. For example you may have an order for 50,000 bushels of grade 1 corn, you need to know right now where you have this (and that could be in several locations), how you can best accumulate and deliver it – from real information, that will also immediately reflect your action in allocating it.

Information that will provide greater insight into what is happening and will therefore lead to better operational and business management will include;

- Current Stock Report (sorts and filters for Customer, IP, Commodity)
- Job Report (date and time user definable)
- Delivery Report (date and time user definable)
- Discharge Progress Report
- Bin Reports (sorts and filters for Specification, IP, Average Quality)
- Route Report
- Bin Cleaning Report
- Operator Log On Report
- Commodity Transfer Report
- Loading/Discharge Stoppage Report
- Traceability Reports

Business benefits

The benefits that can be obtained from bulk commodity and traceability software are both commercial and operational. Benefits that have been proved are;

- Visible bin control quality at all times
- “Admix” avoidance by route (path) interlocking

- Accurate blending management, made possible through bin content quality data
- Complete audit trail for customer satisfaction, quality and accreditation
- Electronic signatures to FDA recognized procedures – providing responsibility trails and control of authorized procedures
- Batch sizes can be reduced to allow risk reduction in the case of errors
- The facility operator is relieved of “guess work” and estimation
- Accurate route setting even for manual operations
- Any type of management report, from throughput, to space utilization, energy consumption, all in real-time
- Reports can be made available through web-technology, allowing group headquarters to optimally control a complete wide area group of elevators, and also to allow direct customer and supplier interaction where that is to advantage

The ideal elevator?

Experience in deploying CommTrac™ bulk commodity management and traceability systems has shown that a different approach has to be taken in specifying the design requirements of elevators. Construction principles should be based upon operational flexibility rather than high capacity and throughput.

The primary structural consideration in providing flexible operations is the need for many small bins as opposed to fewer larger bins; conical bases are also preferable to maintain high product flow when emptying.

Mechanical equipment selection should give higher consideration to being self-cleaning or being easy to clean; belt conveyors as opposed to drag conveyors and self cleaning elevator boots are effective solutions. The ability to deliver maximum throughput rates from single sources is also desirable, negating the need to open multiple bins simply to maintain throughput.

The routes through a facility shall be capable of being controlled, sensed and monitored; automation can play a big part in this.

The ability to weigh in-process with optimally positioned draft scales is also desirable; this can provide exact inventory figures, segregation control and optimized blending.

Valuable gains that are almost byproducts of facility management are maintenance asset monitoring (run-time, maintenance scheduling) and energy monitoring to provide energy efficiency.

The most necessary part of the ideal elevator is the experienced application of Management and Traceability software will significantly improve business and automate the routines for auditing, accreditation and traceability.

Software solutions are available that will deliver these benefits; they work and are field-proven.

About the author...

David Trueman is a director of DBIS, the company that developed and delivers CommTrac; the leading management and traceability software package for bulk commodity industries. He has considerable experience in the real world operational and management issues of the grain and oil seed handling business.

David Trueman
DB Information Systems Ltd
9 Station Road
Adwick-le-Street
Doncaster DN6 7DB
United Kingdom

david.trueman@dbis.biz

www.dbis.biz