

Tallybeam OEE

Introduction

This document is a general introduction to the new Tallybeam Timber Measurement system which now includes OEE capabilities.

In order to keep pace with ever advancing PC technology, Systek Controls has developed a new measurement interface board which connects the measurement beam to the computer, called 'Intelligent Input Output Card' or 'IIOC' for short.

This new interface connects to the computer via an industry standard USB port, which means we are no longer reliant on custom made boards fitted inside the computer itself, where the computer motherboard interface to these cards is rapidly becoming obsolete, hence the need to move forward with new hardware design.

As part of the support for this new card, Systek Controls has also developed a new version of the Tallybeam Program. This is a full featured Windows based program which offers many of the original features plus numerous new ones, amongst which is the ability to calculate and display overall equipment efficiency 'OEE' figures for the selected line.

The following pages provide a summary/breakdown of the basic supported features for the new system.

Job Database

This feature was available on the previous Tallybeam Systems, but has been enhanced to include many new supported fields which may appear in generated reports or provide control over the new OEE system.

Standard fields include:

CUSTOMER	- Names the customer for the current order
JOB_NUMBER	- Specifies the current order number
DESCRIPTION	- A short description for the current order
PROCESS	- A Process description for the current order
CODE	- SAP or Product code
TIMBER_TYPE	- Timber type description
SPLIT_FACTOR	- Split factor associated with the current product
M3_IN_PACK	- Pack size in M3 when producing cubic metre packs
PIECES_IN_LAYER	- Number of pieces in a pack layer
INPUT_THICKNESS	- Timber input thickness or height
INPUT_WIDTH	- Timber input width
OUTPUT_THICKNESS	- Timber output or finished thickness or height
OUTPUT_WIDTH	- Timber output or finished width
ENABLE_BUNDLING	- Turn bundling option on or off
PIECES_IN_BUNDLE	- Specifies the number of pieces in a bundle
PIECES/METRES	- Specifies Piece packs or linear metre packs
PACK_SIZE	- Finished pack size
FIXED_LENGTH	- Option to turn on or off fixed length counting
FIXED_LENGTH_SIZE	- Specifies the nominal fixed length to be used
SIZE	- A descriptive size field based on finished dimensions
BASE_UNIT	- For standard systems this is always 'M' for metres
BASE_M3	- M3 Base for non standard products
CONV_M3	- M3 Conversion factor for non standard products
BASE_PC	- Pieces Base for non standard products
CONV_PC	- Pieces Conversion factor for non standard products
QTY_LABELS	- Number of labels to print for each pack
TALLY_REQUIRED	- Include or exclude a tally display from the printed pack label
PRINT_DIALOG_REQUIRED	- Enable or display post production edits
SAP_DESCRIPTION	- Extended product description
PRODUCT_TYPE	- Extended product type description
WORK_CENTRE	- Descriptive name of the line which produced the product
ORDER_M3	- Target M3 for the current order (Part of the OEE statistics)
TARGET_SPEED	- Expected throughput speed for the current product (OEE)
SCP_SPEED	- Historic speed for reports
PLANT	- Plant description to identify the site

The database files can be stored on each Tallybeam system or a single copy can reside on another PC and all Tallybeams fetch and use the latest copy from this location.

OEE

The OEE Calculations are broken down into the following sections, the final figures being derived from the following sources.

% Availability

This quantity describes how long the line has been productive against its potential productivity time; the figures are derived as follows:

$$\text{Availability\%} = \text{Productive Time} / \text{Actual Run Time} \times 100$$

Where:

$$\text{Productive Time (Minutes)} = \text{Actual Run Time} - \text{Total Down Time}$$

$$\text{Actual Run Time} = \text{Total Run Time (Minutes)} - \text{Planned stoppages}$$

$$\text{Total Down Time (Minutes)} = \text{Unplanned stoppages} + \text{Unallocated stoppages}$$

Note1: Planned stoppages such as breaks, lunch etc is considered 'unproductive time' as they are already known and anticipated stoppages.

Note2: If a site is running multiple shifts or the current order takes longer than a working day to complete, then time elements for the above figures are split by date, shift and order number.

E.g. If a site runs 2 shifts per day, shift 1 10:00Am to 6:00Pm, shift 2 6:00Pm to 2:00Am and a new order is started at 1:00Pm but did not finish until 1:00Am taking 12 hours to complete, the total run time will be broken down as follows:

Shift 1, Day 1 1:00Pm to 6Pm = 5 Hours

Shift2, Day 1 6:00Pm to 12:00Pm = 6 Hours

Shift2, Day 2 12:00Pm to 1:00Am = 1 Hour

Example:

The current order takes 12 hours to complete (12 x 60) = 720 Minutes.

During this period there was 2 x 30 minute lunch breaks 60 Minutes planned stoppages

3 x 15 minute breaks 45 Minutes planned stoppages

And a total of 178 minutes unplanned stoppages (various reasons)

$$\text{Actual Run Time} = 720 \text{ minutes} - 105 = 615$$

$$\text{Total Down Time} = 178 \text{ minutes}$$

$$\text{Productive Time} = 615 - 178 = 437 \text{ Minutes}$$

$$\text{Availability\%} = 437 / 615 \times 100 = 71.05\%$$

% Performance

This quantity describes how well the line is performing, that is its actual timber throughput against its expected throughput.

$$\text{Performance\%} = \text{LM Sum} / \text{Split Factor} / \text{Target LM Out} / \text{Productive Time} \times 100$$

Where:

LM Sum = Actual LM produced (Measured)

Target LM Out = Target Speed (Database)

Split Factor (Database)

Productive Time (Minutes) = Actual Run Time - Total Down Time

Actual Run Time = Total Run Time (Minutes) - Planned stoppages

Total Down Time (Minutes) = Unplanned stoppages + Unallocated stoppages

Example:

The current order is for 37 Cubic Metres of decking of dimensions 100mm wide, 20mm thick with a fixed length of 4.2M.

Total number of boards = $37 / 4.2 \times 0.1 \times 0.02 = 4,405$

Total linear metres = $4,405 \times 4.2 = 18,501\text{M}$

The expected throughput for this line is say 31.5M/Min

Expected job completion time would therefore be $18,501 / 31.5 = 588$ minutes approximately

Actual job completion time including 67 minutes of stoppages was say 723 minutes

At the end of the run,

Production Time = $723 - 67 = 656$ minutes

LM Sum (Measured) = 18,501

Target LM Out (Database) = 31.5

Split Factor (Database) = 1

Performance% = $18,501 / 1 / 31.5 / 656 \times 100 = 89.53\%$

% Quality

This quantity describes the ratio of good timber to rejected timber for the current production run.

$$\text{Quality\%} = (1 - \text{Rejected M3} / \text{Order M3}) \times 100$$

Where:

$$\text{Rejected M3} = \text{Reject LM Sum} \times (\text{Finished Thickness} / 1000) \times (\text{Finished Width} / 1000)$$

Reject LM Sum (Measured Rejected LM)

Finished or Output Thickness (Database)

Finished or Output Width (Database)

Order M3 (Database)

Example:

Using the same example order as shown for 'Performance' above, let us assume that a total of 23 lengths had been rejected due to defects.

$$\text{Reject LM Sum} = 23 \times 4.2 = 96.6\text{M}$$

$$\text{Finished thickness} = 20\text{mm}$$

$$\text{Finished Width} = 100\text{mm}$$

$$\text{Rejected M3} = 96.6 \times 0.02 \times 0.1 = 0.1932$$

$$\text{Order M3} = 37$$

$$\text{Quality\%} = (1 - 0.1932 / 37) \times 100 = 99.47\%$$

% OEE

The actual OEE figure is a summation of the previous 3 quantities prior to the multiplication to produce a readable percentage figure.

$$\text{OEE\%} = \text{Availability} \times \text{Performance} \times \text{Quality} \times 100$$

So taking the figures from the three previous examples we arrive at an OEE figure of:-

$$\text{OEE\%} = 0.7105 \times 0.8953 \times 0.9947 \times 100 = 63.27\%$$

For correct operation of the OEE system each product located in the job database *must* have the following valid fields:-

- ❖ Target Speed specified in M/Min
- ❖ Order M3
- ❖ Split Factor
- ❖ Finished width
- ❖ Finished thickness

All of which can be fixed predefined values with the exception of 'Order M3' which will change on an order by order basis.

Other OEE Related Benefits

Since the Tallybeam system collects more information other than measured timber, it is now possible to provide other statistics which may appear in reports or on the main OEE screen, these include such things as:-

- ❖ Planned and Actual speeds
- ❖ Planned and Actual cubic metre production
- ❖ Planned and Actual cubic metres per hour
- ❖ Overall pack summary for the current running job
- ❖ Order downtime summary
- ❖ Line performance
- ❖ Production summary

The information which is displayed on screen is also available as a CSV report file which may be copied to another computer and loaded into a spread sheet program such as Microsoft Excel for additional data analysis if required.

The screen shot below shows a typical example of the OEE screen.

