BellHawk Equipment Tracking Option User Manual

Table of Contents

Contents

Introduction

The purpose of the equipment tracking option is as follows:

1. To track the setup, run, down, and cleanup time for machines, production lines, and test equipment, which are here referred to as a machine, on each work order.
2. To simplify transaction scanning by enabling a user (or team) to login to a machine and then to record the start and end of each work order operation as it is processed by the machine.
3. To capture the labor and machine time as well as the materials cost of processing a work order operation on a machine.
4. To handle run-groups, in which multiple work orders are run at the same time on a single machine. Here the system allocates the labor and machine time, as well as the materials quantities, across the multiple work orders being run at the same time on the machine.

Typical applications of run groups include:

1. Tracking the conversion of master rolls into a number of different products using operations such as coating, printing, slitting and coating.
2. Cutting parts for a number of work orders from a common sheet of steel or wood.
3. Mixing a batch of materials that will be used to make a number of products.

This manual assumes that readers are familiar with the operation of the standard production tracking features of BellHawk as described in “BellHawk Work order and Materials Tracking User Manual”. Adding the equipment tracking option adds to the features available with the standard production tracking system but with some changes described in this manual.

Features

The equipment tracking option enables the following features:

1. Work order steps or operations to be scanned into and out of machines.
2. Tracking changes in machine state with the time in a machine state tracked to the work orders running on the machine at that time.
3. Employees to scan into and out of machines. Their time is automatically allocated to the work orders when these work orders are running on the machine. This saves the need for employees to scan in and out of each work orders running on a machine they are operating.

The run-groups feature adds the following capabilities:

1. Ability to have more than one work order scanned into a machine at the same time.
2. Having machine time allocated between the work orders running on a machine at the same time.

3. Having employee labor time allocated between work orders running on the machine at the same time.
4. Having Materials scanned into one work order in a run group allocated between all work orders currently in a run group according to the amount of materials specified to be consumed on each work order.
5. Having Materials returned from one work order in a run group allocated as a credit to all work orders currently in a run group according to the amount of materials specified to be consumed on each work order.

Please note:

1. Different hourly rates can be associated with the setup, run, down, and cleanup phases of machine operation. These rates will typically include that part of the facility operation cost normally associated with overhead.
2. The correct allocation of resources is dependent on the sequence of operations. BellHawk is a real-time data collection system that does its resource (labor, materials, and machine) allocation in real-time. BellHawk does not try to go back in time and try to figure out how resources should have been allocated, it simply allocates them as it goes. So it is important that machine operators be trained in the correct sequence for recording their actions.
3. Production supervisors can edit the resources recorded on work orders, including the times or quantities allocated to the work orders, but they must separately record adjustments to resultant discrepancies in inventory.
4. While, in general description, we refer to scanning work orders into and out of machines, it is work order steps or operations that are actually scanned and allocations of resources are made at the work order step or operation level.
5. In the following, we will refer to Work Order Steps but, equally as well, operations rather than route steps can be scanned to record machine time and operator labor for rework or other operations that were not pre-specified.

Correct Sequence of Operations

1. Scan employee(s) into machine. If there are many employees working on a line then they can be recorded in as a team.
2. Scan work order step(s) into machine. Note only one work order step at a time is allowed if Run Groups is not turned on using the System Administrator's System Parameters screen, Production Tab.
3. Scan raw materials into work order step on machine (can also be done incrementally while machine is running).
4. Change machine state to setup and then to run when setup is complete.
5. Change machine state to down, if the machine goes down and record the reason code. Then change state to run again when the machine is fixed.

6. Change machine state to run-completed.
7. Record material out from work order steps (can also be done incrementally while machine is running).
8. Change machine state to clean up and then to idle when clean up completed.
9. Scan work order step(s) out of machine, selecting End Run Group and Complete Operation, if this is the end of a run group and operations on all work order steps have been completed.
10. Repeat 2-9 for other work orders or run groups.
11. Scan employee or team out from machine when they go on lunch break or this is the end of their shift.

Please note that recording changes in machine state is optional. A machine can be left in Run state and then all allocations and machine time will simply reference the machine being in this Run state.

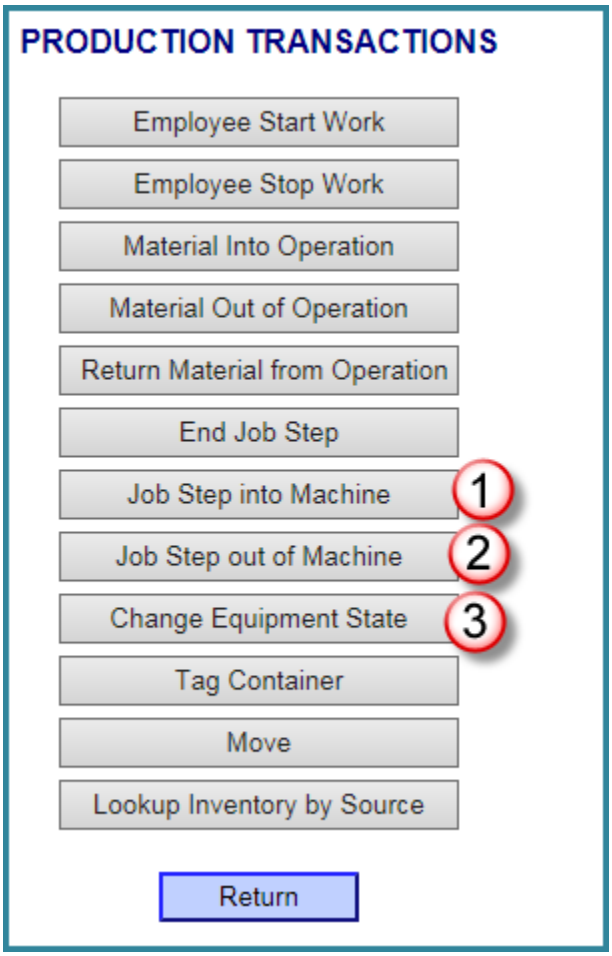
Production Transactions

As with standard production tracking, the Production transactions are reached from the Production transaction role switchboard.

The machine tracking option adds three new transactions:

1. Work order Step into Machine (1)
2. Work order Step out of Machine (2)
3. Change Equipment State (3)

The other transactions work as described previously except that Employee Start Work enables recording an employee into a Work order Step or a Machine.



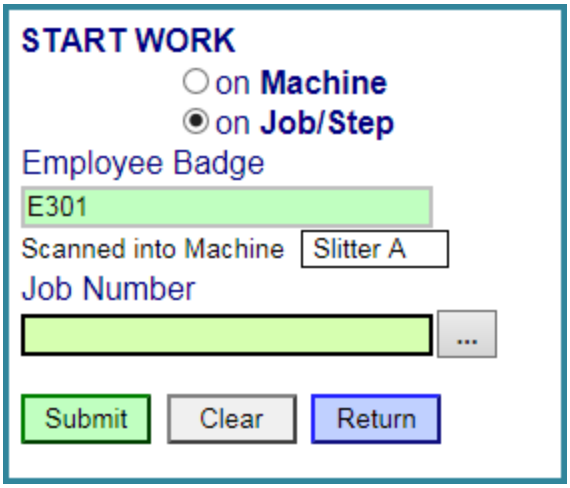
Employee Start Work Transaction

If machine-tracking is licensed then this transaction is changed to add a selection for Machine or Work order/Step (1). It defaults to Machine.

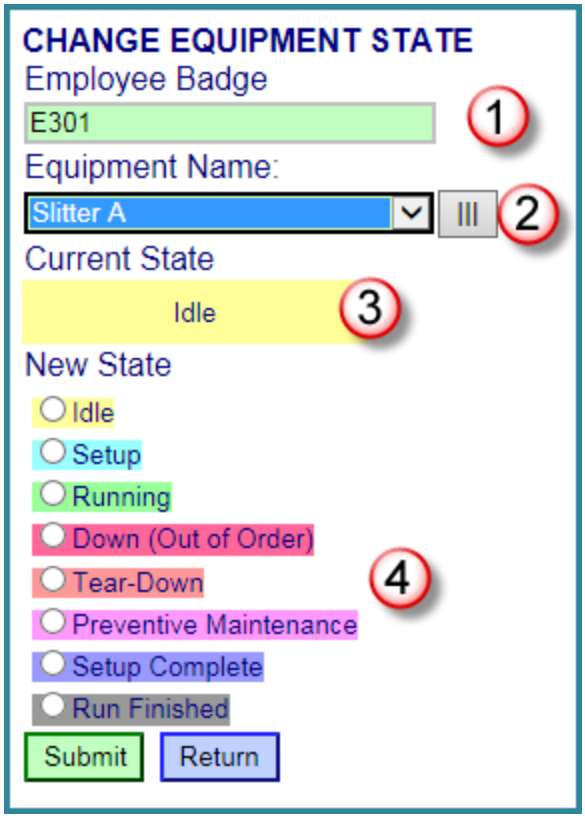
If the Machine Option is selected then, after scanning his badge (2), the operator will be asked to select the Work Center (3) and then from a list of machines (4) in the selected work center. Alternately a barcode with the machine code can be scanned into the data entry box to select the machine.

When Submit is selected then the employee is associated with that machine.

If the Work order/Step option is selected (1) then the Start Work screen appears at right. This functions in the same way as described in the user's manual for standard (non-machine) production tracking.



Recording Changes in Equipment State



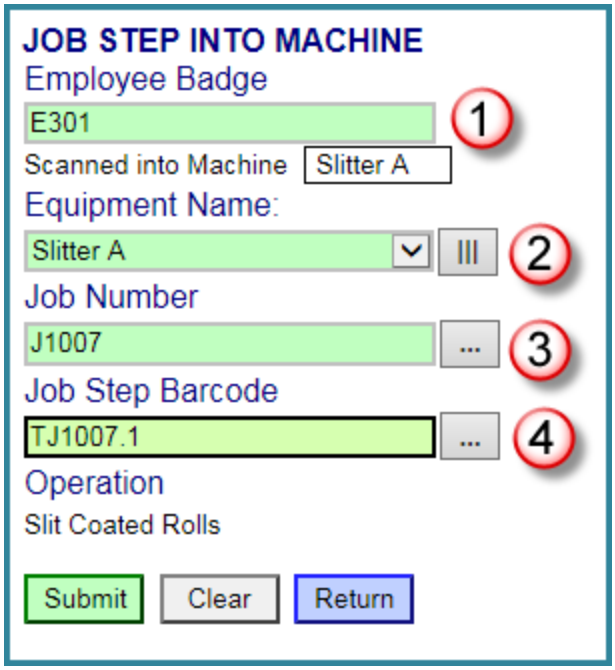
This enables an operator to select a machine (2), after scanning their badge (1), and to change the state of that machine.

Once the Equipment is selected (2) the current state of the machine can be seen (3).

The state of the equipment/machine can be changed by selecting one of the radio buttons (4), and then selecting Submit.

These changes in state can be done, whether or not the machine/equipment is associated with a work order step.

Recording Work order Step into Machine



After scanning their employee badge (1), the employee can select the machine (2) and then select or scan the Work order (3) and Step (4) and then select Submit.

The Run-Groups can be turned on then multiple work orders can be scanned into the same machine at the same time. The operator will receive a warning when they are adding a second and subsequent work order to a machine to form a run group in case they had simply forgotten to scan a prior work order off the machine.

Recording Materials in and out of Work order Steps

These transactions function exactly the same as for standard work order tracking except that any materials recorded in to a single work order step is allocated between all work order steps active in a run group on the machine on which the work order step is running.

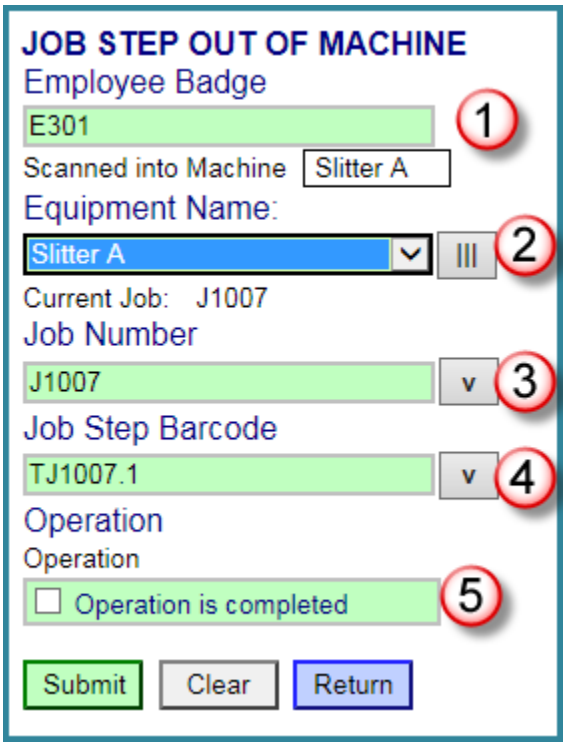
Please note that a work order step can only be running on a single machine at any one time.

Material returned from a work order step that is part of a run-group is allocated in the same way.

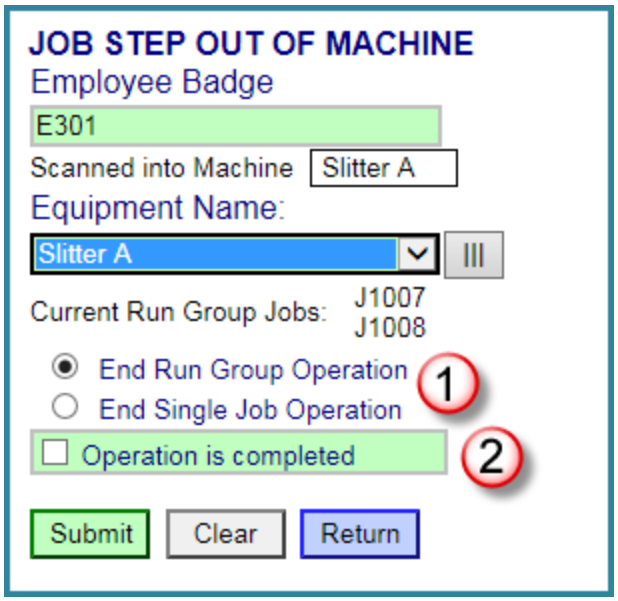
Work order Step out of Machine Transaction

After scanning their badge (1), the operator can select the equipment (2).

If there is not a run-group currently associated with the machine then the user can select the work order (3) and step (4) and then indicate whether the operation is complete (5) before selecting Submit.



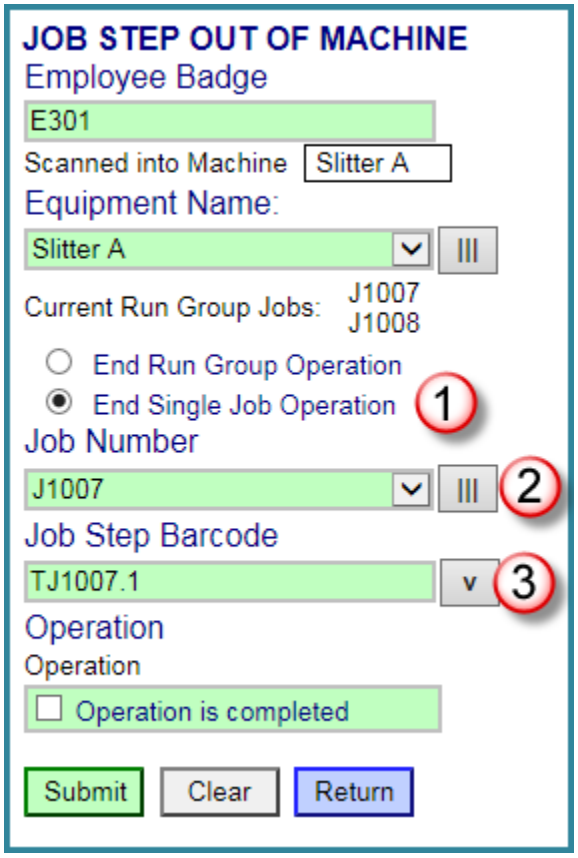
If there is a run group associated with the machine then the screen changes to that shown at right.



Here the operator has a choice to End all work orders in the run-group (1) or simply to end a specific work order.

The operator can also declare that the operation is completed on the specific work order steps (2).

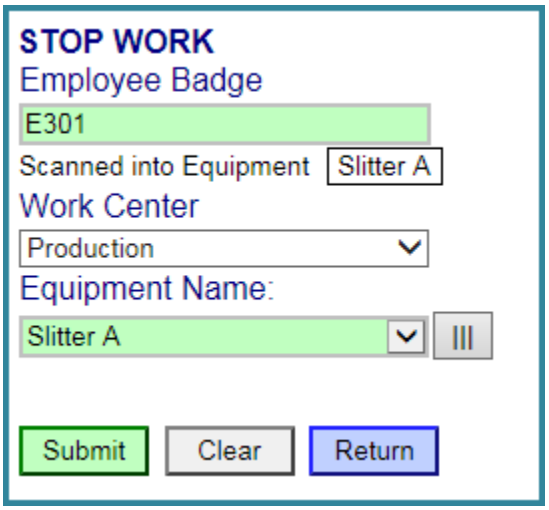
If the operator selects to end just a single work order step (1) then the screen changes to that shown below:



In this case the operator can select the Work order and Step to end, leaving other work order-steps associated with the machine as active work orders.

Please note that, while work order steps can be dynamically added to, and subtracted from, run-groups, resources are only dynamically allocated across work order steps while they are associated with the machine.

Employee Stop Work Transaction



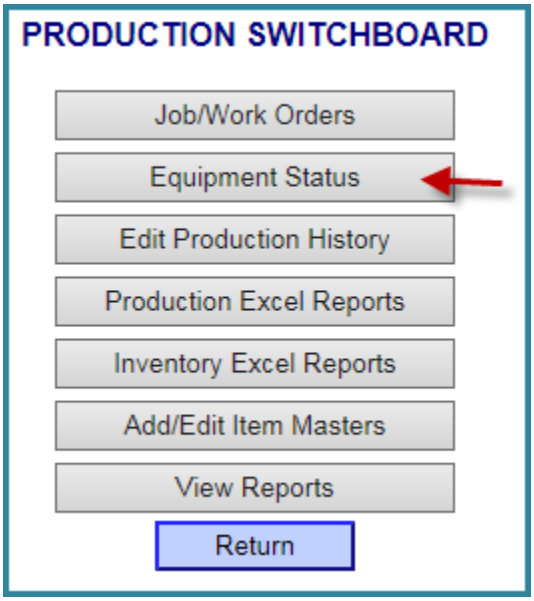
If the employee is associated with a machine then the Employee Stop Work transaction looks as shown at right, so that the employee can scan out of the machine.

If they are scanned into a work order step (not machine) then this transaction will request the work order and step and allow them to terminate the operation as in standard production tracking.

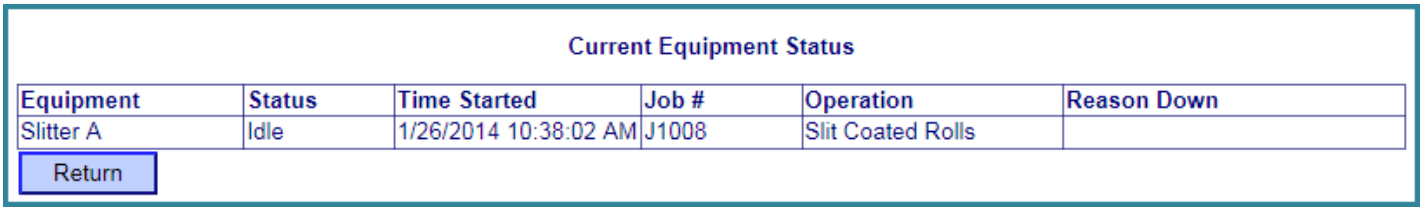
Additional Features for Production Manager

Viewing Machine State

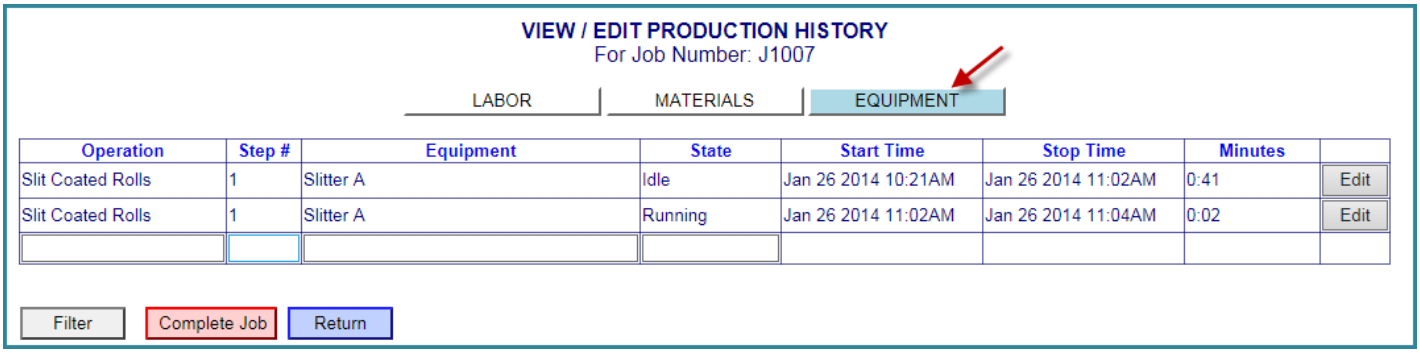
The machine tracking option adds an option to the production manager's switchboard to view the current state of his machines, as shown at right:



Selecting this shows the current state of the machines, as shown below:



View/Edit Production History Screen



When machine tracking is licensed a third Equipment tab is added to the production history edit screen. This shows how long the machine was running in each state on the work order and the number of allocated minutes.

Please note that:

1. On the Labor tab, the number of minutes is the number of minutes allocated between all the work order steps running on the machine.

2. On the Materials tab the quantities are the allocated quantities.

Transaction History Log

The changes in machine state and the start and end of work order steps on machines are recorded in the work order transaction history log. These transactions are shown on both the Excel export and the transaction log report.

Setup

Setting up Machines and Work Centers

Setups for Work Centers and Machines are imported using Excel spreadsheets as described in the BellHawk Setup Manual.

Work Centers are setup as described previously in the BellHawk Production Tracking Manual.

WORKCENTER	WcCode	WorkCenterName
	Production	Production

Machines/Equipment can then be imported using the format shown below:

EQUIPMENT	EquipmentCode	EquipmentName	WcCode
	SlitterA	Slitter A	Production

Each piece of equipment must be associated with a Work Center as shown above.

Equipment Classes can also be defined:

EQUIPMENTCLASS	ClassCode	ClassName
	Slitters	Slitters

Then they are specified as part of the Work order Step Resources, which may be inherited from the Item master record:

JOB ROUTE STEP RESOURCES
J1001
Finished Item: SGR6
6 inch wide Green Coated Roll
Qty To Be Made: 100
Route Quantity: 100 feet
Step 1
Slit Coated Rolls

		Line #	Resource	Number	Description	Quantity	Backflush Location	WIP	
↑	↓	1	Part In	GCR12	12 inch Green Coated Roll	100 ft			Edit
↑	↓	2	Part Out	SGR6	6 inch wide Green Coated Roll	100 ft			Edit
↑	↓	3	Labor	Operators	Operators	30 min			Edit
↑	↓	4	Equipment Run	Slitters	Slitters	30 min			Edit

Add New Return

Run Group Allocations

The run-group algorithm breaks time down into segments in which there are a group of common work order steps running on a machine with one or more employees running the machine. It then further breaks this down into time segments in which the machine is in a setup, run, down, or cleanup state.

For each time segment:

1. It allocates the labor time for each employee equally across all work orders running at the same time on each machine. It then adds up the cost of the allocated hours for each employee at the standard labor rate for that employee and assigns the cost to the work order step.
2. It allocates the machine time equally across all work orders running at the same time on each machine. It then adds up the allocated costs of the setup, run, down, and cleanup costs for each work order and assigns the cost to the work order step.

To allocate material-in recorded when a run group is running on the machine:

1. BellHawk adds up the expected total quantity based on the part-in quantities each for work-order for the work order steps currently grouped in that operation.
2. For each work order step currently part of that run group, BellHawk determines what percentage of the expected total (from step 1) to allocate.
3. The percentage (from step 2) is used to calculate the appropriate fractional part of the actual input quantity to allocated to each work order step in the run group, which is saved to the materials history.

For example, let's say we have a run group of 3 work orders WO1, WO2, and WO3, which are all in scanned into STEP1

Based on the item routes and quantities to be produced, required quantities of ITEM_A for STEP1 are

WO1: 5 kg of ITEM_A

WO2: 15 kg of ITEM _A

WO3: (ITEM_A not required)

If 4 kg of ITEM_A are scanned into STEP1, the recorded material-in will be allocated as follows:

WO1: 1 kg

WO2: 3 kg

WO3: 0 kg

Note that there is no need for total compatibility between the part-in records for different work order steps combined as a run group but the part-in quantities have to be in the correct ratio.

Static versus Dynamic Run Groups

BellHawk is designed to support dynamic run groups where work order operations start and end on a shared machine asynchronously, with BellHawk deciding way work orders are sharing the machine at any one time.

It is also possible to setup a static run group in which work orders are assigned a priori to a run group, as described below.

The run group number can then be used to record the group of work orders onto and off of the machine by using the run group number instead of a work order number when recording the work-order step into and out of the machine. The step barcode still has to be scanned from a work order, in the group but this will cause all the run group work orders to be scanned into and out of the machine, rather than scanning them individually.

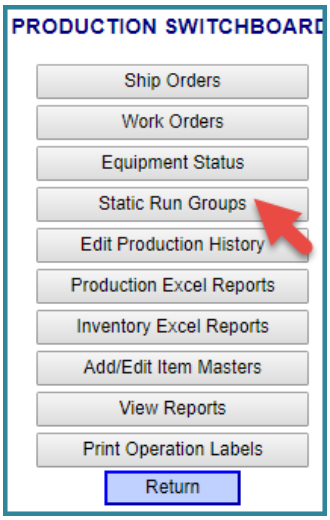
Also the static run group number can be used instead of an individual work order number when scanning materials into a machine. Again the step has to be scanned from a work order in the group but this makes more sense operationally than scanning one of the work orders and having the material in allocated across all work orders in the group.

Static Run Groups

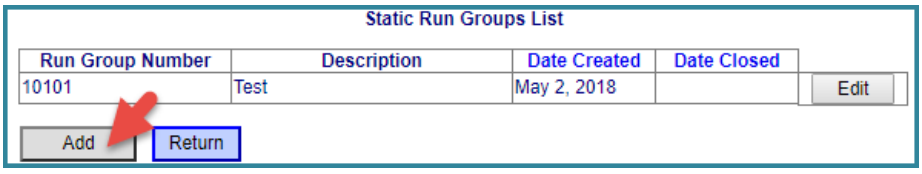
To create a Static Run Group, please proceed as follows

Select the Production button on the Main Switchboard.

Select the Static Run Groups button on the Production Switchboard.



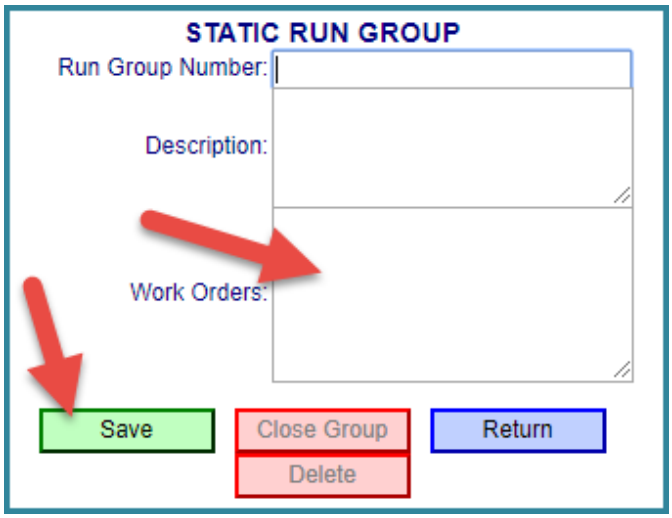
Select Add to create a new Static Run Group.



You will take a unique barcode and type it into the Run Group Number Space.

In the Work Orders space each Work Order gets a line to create a run group.

Once all the Work Orders are in the Work Orders box the user will select the Save button.



Having created the Static Run Group, then operators will be able to use the Run Group Number barcode instead of a Work Order number on the start work, end work, material in and material out transactions.

This will also enable the materials and labor to be allocated across all the work orders associated with the static run groups.

Static run groups are a useful simplification when a group of work orders are processed together. This is, as opposed to, dynamic run groups where work orders dynamically join and leave a run group during a run of a machine.

