White Paper

Honeywell

Honeywell Wintriss

Automated Collection of Real-Time Production Data

This paper describes the functions and architecture of a robust automatic data collection system for machines used in discrete manufacturing.

Introduction

The software systems that you use to run your business - including Enterprise Resource Planning (ERP) and Manufacturing Execution Systems (MES) - rely on production data collected from the shop floor. In most cases, this data is collected manually and entered into the system by a human operator. The three common problems with manually collected data are untimeliness, inaccuracy, and bias. Considering that this raw data forms the basis for all subsequent production reports - and that important decisions are made based on those reports - any problems with the initial data collection can start a ripple effect that results in a negative impact on your business.

This paper will detail the shortfalls of manual data collection, explain how automatic data collection can eliminate these errors, and describe the function and architecture of a robust automatic data collection system.

Manually collected data is not timely

In a typical scenario, manually collected production data is entered into the system only at predetermined times such as at the end of a shift or job. The data is then made available in the form of reports and used for analysis. For long-term analysis, viewing the data “after the fact” is usually sufficient.

However, the factory floor is a dynamic environment, and only knowing what happened after the fact can be a detriment to productivity. Consider the following:

- When a machine goes down, how long does it take maintenance personnel to respond?
- Do the people responsible for material handling know when a machine is starved for raw material?
- If a machine is down for an extended period of time, is the scheduler able to quickly respond and modify workflow to keep jobs moving through the queue?

Another problem with manually entered data is that it is often incomplete. This is due to the fact that the actual data entry task usually falls to someone with many other responsibilities. Generally speaking, data entry is a tedious, boring task that is often put off for as long as possible. It is not uncommon for raw data to sit around for hours, if not days, before being entered into the system. This results in reports that are incomplete insofar as the latest data is concerned.

Manually collected data is inaccurate

There are many opportunities for inaccuracies to creep into a manual data collection system. Often the data must be first written down, and later entered into the system – sometimes by a different person than the one that recorded it in the first place. Typographical and transcription errors are common. Human error is inevitable, and once these errors become part of the data set, they become difficult to detect and eradicate, and make all the resulting reports suspect.

Manually collected data is biased

Whenever a human operator enters data, he or she has influence over exactly what information is entered and when it is entered. Consider the following example:

Let’s say that the controller on Machine Number 1 detects an easily correctable tooling problem and shuts down the machine. Let’s also say that the operator responsible for Machine Number 1 is busy performing a changeover or troubleshooting a problem elsewhere in the plant. Machine Number 1 sits there idle for an hour while the operator is otherwise occupied. When the operator is free, he spends 5 minutes fixing the tooling problem, and then restarts Machine Number 1. Even though he was busy with another machine, the operator is worried that he’ll be disciplined for not attending to Machine Number 1 quickly enough, so he enters “Tooling problem – 1 hour and 5 minutes” in Machine Number 1’s log as the reason for downtime.

In reality, this is wrong. The machine was down for 1 hour and five minutes. However the “real” reason for most of this downtime was not “Tooling Problem”, it was “No Operator Available”. Perhaps because the operator did not want to appear inattentive, or simply because it is easier to blame downtime on a mechanical problem rather than personnel issue, the operator's bias played a part in how the downtime was reported.

Bias can be expensive. In the example above, a properly identitified problem- "We need an additional operator" - ends up being misdiagnosed as a costly engineering project – "We need better tooling".

Automated Data Collection

The problems outlined above can be eliminated when production data is collected automatically. When production data is collected automatically as it happens, you can be assured that it is timely, accurate, and unbiased. Until recently, automatically collecting production data was a costly and unreliable proposition. You had the choice of writing your own custom system (at great expense), or using one of the commercially available packages.

Commercially available data collection software tended to be vendor-specific – especially those that collected data from proprietary machine controllers. If you had several different types of machinery/controllers, you'd need several different data collection systems that would have to be custom-integrated by some third party software writer. Many proprietary collection systems required a special serial network, as well as client software that had to be installed on any workstation that needed access to the production data. These features made them quite maintenance intensive.

Fortunately, a number of factors have recently combined to make automatic data collection technology much more reliable and accessible:

- The emergence of high speed Ethernet as the de facto standard for local area networks has resulted in a tremendous decrease in the cost of network cards, adapters, and other hardware, thus allowing Ethernet to replace the outdated, slow, and expensive dedicated serial networks.
- It turns out that the Internet and email were not passing fads after all. Virtually all computers are now shipped with a web browser and an email client. Data collection software can now use a web browser to display and manipulate data and email to distribute reports. This has eliminated the need to install maintenance-intensive client software on workstations.
- Database manufacturers adopted Structured Query Language (SQL) as a means to get data in and out of various databases. This makes it much easier for different software packages to share data, and allows an SQL-based data collection system to provide data to MES and ERP software.
- It is now easier to communicate with the equipment. Microsoft and the automation suppliers got together and developed a set of standards (called OPC – described below) that allows for interoperability of different devices.

Turnkey data collection software packages that use these technologies are easy to install, maintain, and upgrade. These products are scalable and have the ability to share with and receive data from your existing software systems.

Communicating with the equipment

One of the biggest challenges in automated data collection was finding a way to communicate with a wide variety of different types of equipment. In recent years, several factors have made this task much easier.

The ubiquity of Ethernet, along with its inherent reliability and speed has all but eliminated the need for separate slow and costly serial networks dedicated to machine data collection. New controllers feature built-in Ethernet capability; older controllers can usually be fitted with Ethernet cards or serial-to-Ethernet converters.

The maturation and widespread use of communication protocols such as Modbus TCP have provided the means to move raw data in and out of many proprietary controllers, PLCs, and other devices.

Finally, the adoption of the OPC Data Access Specification by controller manufacturers has enabled interoperability in multi-vendor systems. OPC is short for “OLE for Process Control.” It is a communication standard that resulted from the collaboration of over 150 leading worldwide automation suppliers working in conjunction with Microsoft. To be certified, OPC devices must pass a series of compliance tests.

The often-cited analogy for the impact of OPC on the data collection world is the change undergone by the handling of printer drivers when DOS became Windows. Under DOS, the developer of every application had to also write a printer driver for every printer. So Lotus wrote the Lotus123 application and the Lotus123 printer drivers; WordPerfect wrote the WordPerfect application and the printer drivers, and so on. In addition, developers had to write a separate printer driver for every brand or type of printer they wanted to support.

Windows solved the printer driver problem by incorporating printer support into the operating system - now one printer driver serves all applications. The printer drivers had to meet certain requirements in order to be approved, and were written by the printer manufacturer - not the application developer.

In the industrial automation world before OPC, every manufacturer had to write their own proprietary “drivers” to enable their controllers to communicate with Windows. Any data collection system that needed to communicate with a variety of controllers had to have a driver for every controller. The problem was that the manufacturers were not coordinated. Many of the controller drivers conflicted with one another, making the data collection system inoperative. OPC fixed this.

Adding the OPC specification to Microsoft's OLE technology in Windows allowed automation manufacturers to create non-conflicting Windows-compatible drivers that standardized the method of data communication.

Requirements of a good data collection system

A modern data collection system is composed of a data logger, a transaction manager, a database, and a report generator. These programs (shown below in blue) typically operate together on a single server. Some configurations have the database running on a separate server.

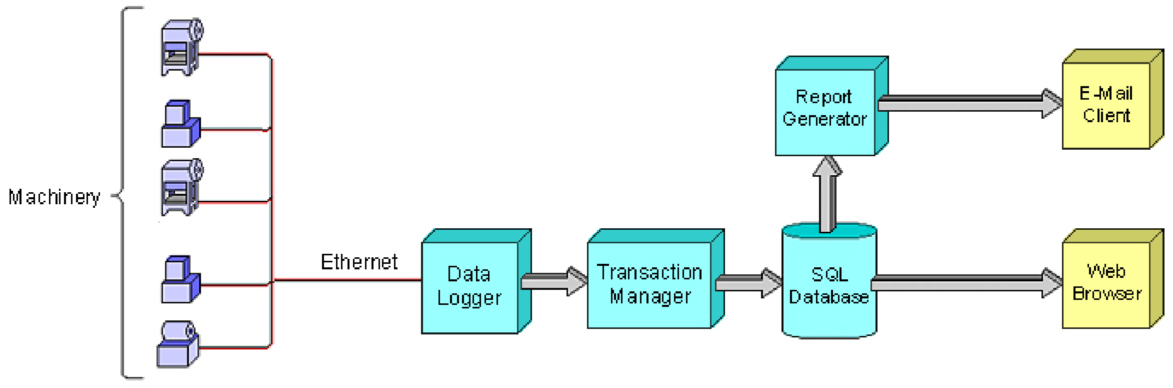


Figure 1 - Block Diagram of a Data Collection System

The two “client” portions are made up of an email client (such as Microsoft Outlook) to receive reports, and a web browser (Internet Explorer, Firefox, Navigator, etc). The web browser acts as the “front end” to the system. It is used to view real time data as well as for setup and maintenance, security access, etc.

The heart of the data collection system is the data logger. The data logger is a program that gathers the production data and puts it in a database. There are two different data logging methods that can be employed by data collection systems. These are distributed data loggers and centralized data loggers.

In a distributed system, a data logger is installed on each machine. The data logger collects production data directly from the machine, stores it in memory, and periodically sends it off to the data repository (usually a database). The advantage of a distributed system is that in the event of a network outage, the on-board data logger can continue to collect production information from the machine while the network is down, and then “backfill” the database when the network comes back up.

However, the disadvantages of a distributed system outweigh this one advantage:

- Since distributed data loggers do not continuously update the database, you cannot view the production environment in real time.
- Data logging capability cannot easily be retrofitted into existing controllers. The hardware requirements for a data logger typically include multiple processors and significant on-board memory. Most existing machine controllers do not have the spare “horsepower” to run a data logger. In almost all cases, a separate dedicated (usually expensive) data logging device must be installed on each production machine.
- These devices often use proprietary communications methods that lock you in to one vendor’s equipment.
- Maintenance is more difficult with distributed systems. Inevitably, there will come a time when it will become necessary to upgrade/update the data loggers. This is usually triggered by changes in the Windows operating system. Instead of simply updating a single data logger (as you would in a centralized system) you must update every individual machine.
- When it’s time for the distributed data logging devices to upload their information to the database, the resulting spike in network traffic has the potential to adversely affect your LAN.

In a centralized system, there is one data logger that constantly polls each individual production machine. A centralized system has many advantages:

- Since the system operates at Ethernet speeds, the data coming from the production machinery can be displayed within a few seconds of real time.
- The control requirements at the machine are greatly simplified when compared to a distributed system. A centralized system requires the machine to pass only a few of the most recent data items (called “tags”) during each polling cycle. Since the controller on the production machine does not need to store and organize data, it is a simple matter to modify existing controls to provide the tags. Many proprietary, PLC, and PC-based controllers employ a communication standard called OPC (described below) that allows them to connect directly to the centralized data logger without modifications. If the production machine is older or has a control that cannot be modified for communications - for example, a relay-based control – a simple Ethernet compatible HMI terminal can be installed on the machine to provide the needed data tags.
- Maintenance is easier because only one data logger needs to be cared for.
- Since the machine constantly updates the data logger, only a few bytes of data need to be sent on each polling cycle. As a result, the network traffic is minimal and constant – there are no spikes caused by large amounts of information being transferred all at once.

The one drawback of a centralized system – data loss in the event of a network outage – is mitigated by the fact that properly designed Ethernet networks are now extremely reliable. By far, the most common cause of network outage is power failure and you’re unlikely to be running your machines during a power failure.

If the Data Logger is the heart, then the transaction manager is the brain. The transaction manager receives the raw data from the Data Logger, parses it, performs operations on it, and stores it in the database.

The database stores all of the production information and "feeds" the report generator and web browser front end. An SQL database (such as Microsoft's SQL Server) makes it easy to transfer data to and from other software. The database for a data collection system should have the ability to simultaneously handle multiple users and should be scalable to grow with your needs.

The report generator allows you to create tabular and graphic reports from the information in the database. Reports can typically be configured to display data according to the date range, shift, machine, tool/part, and/or operator. For example, you could specify that you want a report showing production data for four of your machines, while they were making ten specific parts, being run by five selected operators, on third shift. Once configured, you can save the settings as a new report.

The report generator also controls report distribution. Reports can typically be sent to a printer, sent via email to any recipients that you chose, and/or posted on your network as HTML documents that can be viewed in a web browser by anyone with appropriate access.

In addition, the report generator schedules when reports are distributed. For example, you could set the report generator to post the previous day's Production Report onto your network each morning. Once you've set up the distribution schedule, the report generator will automatically generate and distribute the reports.

Which data are collected?

Believe it or not, you can learn a lot about your operation by collecting just three pieces of data (a.k.a. data “tags”) from each machine or line. These are part count, machine “state”, and an error code that corresponds to a downtime reason.

Parts Counts

Collecting an accurate part count is not as simple as it might appear. When the transaction manager receives a count from the data logger, it must compare it to the counter value collected from the previous polling cycle. Advanced systems also compare both the current and previous counter values to a third “hidden” non-resettable counter. By applying a series of logical steps, these advance transaction managers can look at the current counter value and determine:

- Did the counter simply increment or decrement?
- Was the counter manually reset or changed by the machine operator?
- Was the counter reset because a new job was started?
- Did the counter run up against a maximum value and roll over?

By running the three counters through various algorithms, the transaction manager can correctly decide how to place this information into the database, thereby avoiding “nonsense” data such as indicating that a negative number of parts was produced (caused by an undetected counter reset or job change) or showing that a ridiculously high number of parts were made in a very short time (caused by a manual change to the parts counter).

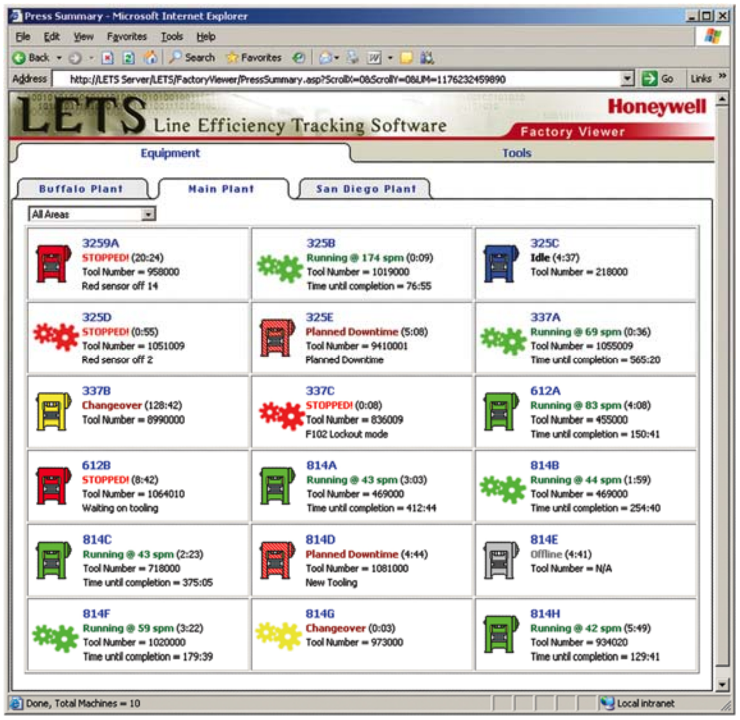
Machine States

The "machine state" refers to the current condition of the machine. These are the typical machine states:

- Running – The machine or line is in production and producing parts
- Idle – The machine is stopped for reasons unknown
- Unplanned Down – The machine is stopped and the data collection software knows the reason for the unplanned stoppage.
- Planned Down – The machine is stopped and it was planned in advance (lunch, break, scheduled maintenance, etc)
- Changeover/Setup – The machine is being set up or changed to make a different part. It may be stopped, or run intermittently during this time. Some data collection packages treat changeover/setup as if it were running or downtime. More advanced systems track it separately, enabling the creation of reports detailing the differences in setup time from any part to every other part on every machine. By tracking changeover separately, advanced systems can accurately predict the completion time for each job in a machine's queue, and can assist in scheduling jobs to minimize the total changeover time (described below).
- Offline – While not a true "state", Offline indicates that the power was off or the network was down.

The transaction manager constantly watches the machine state and logs the elapsed time accordingly. The transaction manager logs every second of time to one of the above states.

Figure 2 shows a graphic summary displaying the state of each machine.


Press Summary - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://LETS Server/LETS/FactoryViewer/PressSummary.asp?ScrollX=0&ScrollY=0&UM=1176232459890
Go Links
LETS Line Efficiency Tracking Software
Honeywell
Factory Viewer
Equipment
Tools
Buffalo Plant
Main Plant
San Diego Plant
All Areas

3259A STOPPED! (20:24) Tool Number = 958000 Red sensor off 14	325B Running @ 174 spm (0:09) Tool Number = 1019000 Time until completion = 76:55	325C Idle (4:37) Tool Number = 218000
325D STOPPED! (0:55) Tool Number = 1051009 Red sensor off 2	325E Planned Downtime (5:08) Tool Number = 9410001 Planned Downtime	337A Running @ 69 spm (0:36) Tool Number = 1055009 Time until completion = 565:20
337B Changeover (128:42) Tool Number = 8990000	337C STOPPED! (0:08) Tool Number = 836009 F102 Lockout mode	612A Running @ 83 spm (4:08) Tool Number = 455000 Time until completion = 150:41
612B STOPPED! (8:42) Tool Number = 1064010 Waiting on tooling	814A Running @ 43 spm (3:03) Tool Number = 469000 Time until completion = 412:44	814B Running @ 44 spm (1:59) Tool Number = 469000 Time until completion = 254:40
814C Running @ 43 spm (2:23) Tool Number = 718000 Time until completion = 375:05	814D Planned Downtime (4:44) Tool Number = 1081000 New Tooling	814E Offline (4:41) Tool Number = N/A
814F Running @ 59 spm (3:22) Tool Number = 1020000 Time until completion = 179:39	814G Changeover (0:03) Tool Number = 973000	814H Running @ 42 spm (5:49) Tool Number = 934020 Time until completion = 129:41

Done, Total Machines = 10

Local intranet

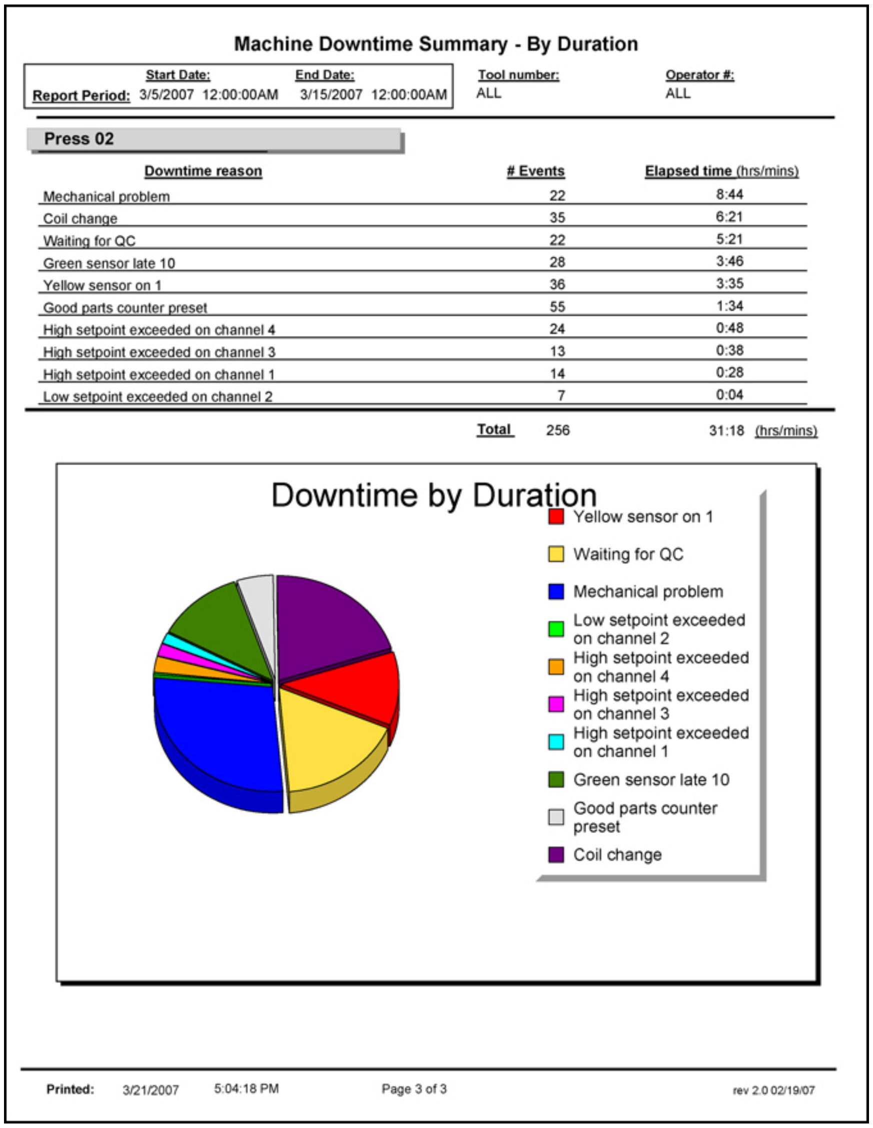
Figure 2 - Machine Summary

Error Codes

The most efficient way to track downtime is for the data logger to collect an error code any time a machine is stopped for any reason. These error codes can be automatically generated by the controller on the machine, or can correspond to a list of downtime reasons that are manually selected by the machine operator (see the section below on Operator Interfaces). The error code is placed into the database by the Transaction Manager and compared to a lookup table specifically created for each machine in the database. By using an error code instead of an error message, network traffic is kept to a minimum.

Another benefit obtained by comparing the error code to a lookup table unique to each machine is that you can create a different set of downtime reasons for each machine type. This way, you can create a small set of specific downtime reasons that make sense for each machine. The alternatives are to either use a huge "master list" of reasons (most of which will not apply to any given machine) or a list of generic reasons too vague to allow you to easily identify specific reasons for downtime.

Figure 3 shows an example of a downtime summary with error codes.



Machine Downtime Summary - By Duration

	Start Date:	End Date:	Tool number:	Operator #:
Report Period:	3/5/2007 12:00:00AM	3/15/2007 12:00:00AM	ALL	ALL

Press 02

Downtime reason	# Events	Elapsed time (hrs/mins)
Mechanical problem	22	8:44
Coil change	35	6:21
Waiting for QC	22	5:21
Green sensor late 10	28	3:46
Yellow sensor on 1	36	3:35
Good parts counter preset	55	1:34
High setpoint exceeded on channel 4	24	0:48
High setpoint exceeded on channel 3	13	0:38
High setpoint exceeded on channel 1	14	0:28
Low setpoint exceeded on channel 2	7	0:04
Total	256	31:18 (hrs/mins)

Downtime by Duration
🟥 Yellow sensor on 1
🟨 Waiting for QC
🟦 Mechanical problem
🟩 Low setpoint exceeded on channel 2
🟧 High setpoint exceeded on channel 4
🟪 High setpoint exceeded on channel 3
🟦 High setpoint exceeded on channel 1
🟩 Green sensor late 10
⬜ Good parts counter preset
🟪 Coil change

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Figure 3 – Downtime Summary

Other Data

Depending on the machine or line, data such as temperature, pressure, force, or other process parameters may also be collected. Typically, these types of data are stored along with a time and date stamp, and can be put into report form as a graph over a specified time period.

Operator Interfaces and Downtime Reasons

Ideally, all data collected from a production machine would be collected automatically with no input required from the machine operator. Unfortunately, this is not possible. While parts count and machine state can usually be collected without operator input, the exact reasons for downtime cannot.

It may be possible to collect some downtime reasons automatically. If a machine is equipped with an "intelligent" controller or monitoring device, and the controller initiates the machine stop, the reason – in the form of an error code - can be reported back to the data logger automatically.

However, if the machine is stopped by the operator or by a piece of ancillary equipment, the data collection software will have no visibility to the reason for stoppage. When this is the case, the transaction manager is forced to log this time as "Idle" time. Since one of the main benefits of a data collection system is to identify reasons for productivity loss, simply logging idle time is unhelpful. There is no such thing as idle time – there is always a reason for a machine not running.

The most effective way to enable an operator to specify the cause of a machine stoppage is to provide a menu of choices from which the operator selects the appropriate downtime reason. If the machine is equipped with a PLC or PC-based control with a menu-driven Human Machine Interface (HMI), then this downtime menu can usually be added to the program. If not, a simple downtime terminal can be constructed from an Ethernet-compatible PLC and HMI, or purchased as a unit. An example is shown in Figure 4.

It is not enough to simply create the menus or install the terminal and instruct the operator to select a downtime reason. Unless the operator is reminded, he or she will not always select a downtime reason each time the machine stops. Remember, if the machine is restarted without selecting a reason, the time will be logged as "idle", and the real reason for the stoppage is lost.

One way to remind the operator to select a downtime reason is to set the controller or data terminal to prevent machine restart until a reason is selected. There is usually a short grace period to allow for brief stoppages, but if the machine is stopped for a significant amount of time, the operator will be forced to select a downtime reason.

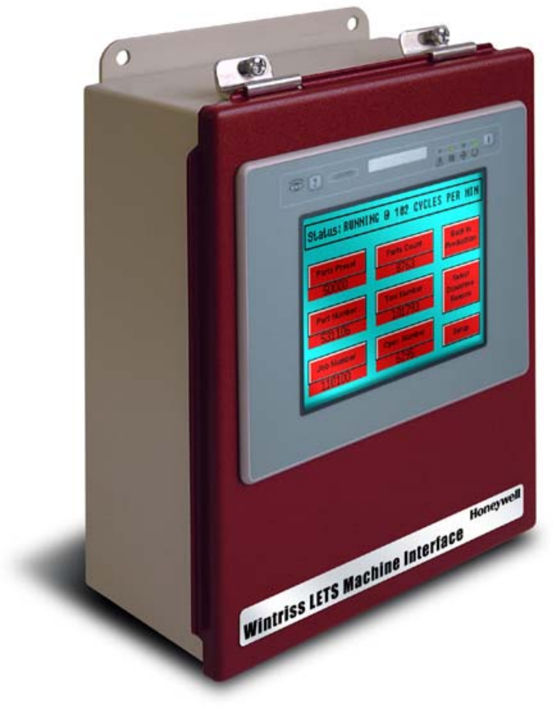

Status: RUNNING @ 102 CYCLES PER MIN
Honeywell
Wintriss LETS Machine Interface

Figure 4 – Ethernet Compatible Data Terminal

Data collection cannot come at the expense of productivity. There are a few design considerations to adopt that will minimize the negative impact on production.

First, you should carefully select a small number of reasons (a dozen or so) for each machine. It helps if you standardize the reasons for each machine type so that operators are not forced to learn a new menu when they move from machine to machine. The most frequently selected downtime reasons should be put near the top of the menu and the least frequently selected reasons should go near the bottom. Finally, if the controller or terminal features multiple menus, it should be set to display the downtime reason menu automatically when it is looking for a downtime reason. This helps to minimize unnecessary navigation on the operator's part.

What can be done with the data?

Once you've collected the data, the sky is the limit on what you can do with it. Production information can be passed on to ERP and MES systems. Schedulers can use the system to accurately predict when jobs will finish and machines will be available. Production counts and efficiencies can be put into report form and distributed. One of the most important metrics that can be created with the data described above is Overall Equipment Effectiveness or OEE.

Overall Equipment Effectiveness (OEE) is a simple percentage that shows the ratio of actual equipment output to its theoretical maximum. OEE factors in equipment availability, speed performance, and quality, and is based on the premise that all production losses on machines and processes can be measured and quantified.

OEE is calculated using a simple formula:

OEE = Availability x Performance x Quality

The *Availability* accounts for unplanned downtime losses. It is equal to the actual machine/process running time divided by the total available time. Planned downtime events such as lunch breaks are not part of, and don't affect, the OEE calculation.

The *Performance* accounts for speed loss. It is equal to the ratio of the number of parts produced over the measurement period (shift, day, etc.) to the theoretical maximum number of parts that could be produced if the machine or process ran at its highest possible speed. The performance calculation is simple when the machine or process produces one part per cycle. However, the performance calculation gets complicated when a machine produces multiple parts per cycle, and even more complicated when a machine makes varying numbers of parts depending on the job being run.

Advanced systems have the ability to calculate an accurate OEE for operations where multiple parts are made during each machine cycle - even when multiple jobs making differing numbers of parts-per-cycle were run during the same period. This is important for metal stamping and injection molding operations.

The *Quality* is the ratio of good parts to total parts produced.

Here's an example:

During an 8-hour shift with 1/2 hour for lunch and two 15-minute breaks, a machine has a maximum availability of 7 hours (420 minutes). If there were 82 minutes of unplanned downtime during the shift, then the machine would have actually run for 338 minutes. The availability would be calculated as follows:

Availability = 338 minutes/420 minutes = 80%

Running at full speed, the machine is capable of producing 6000 parts/hour (or 100 parts per minute). During the 338 minutes of running time in our example, the machine made 25,000 parts. The performance percentage is calculated:

Performance = 25,000 parts/338 mins. / 100 parts/min. = 74%

Out of the 25,000 parts produced, 500 had to be later scrapped. The quality percentage is the ratio of good parts to total parts, and is calculated as follows:

Quality = 24,500 Good Parts/25,000 Total Parts = 98%

The OEE for this example is:

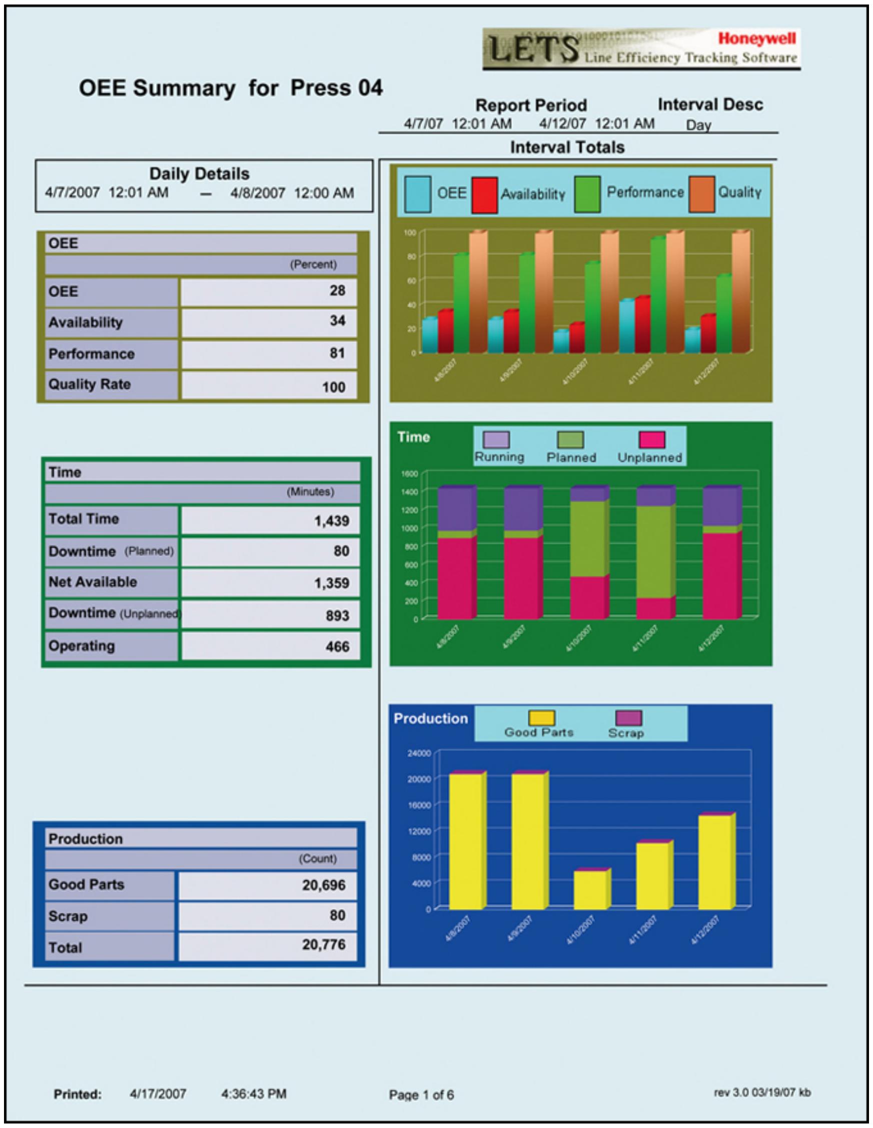
OEE = Availability (80%) x Performance (74%) x Quality (98%) = 58%

You can see that although the component measurements - 80% uptime at 74% of maximum speed with 98% quality - indicate an efficient process, when taken together as OEE, the process is really only 58% effective.

Tracking OEE has many benefits such as:

- Making the most out of a limited amount of investment capital
- Avoiding making inappropriate equipment purchases
- Freeing up capacity to better compete for new business
- Quickly highlighting the greatest areas of improvement to provide the greatest return on assets
- Prioritizing lean initiatives
- Decreasing costs through waste elimination
- Shortening equipment ROI through increased utilization
- Reducing investigation time for root cause analysis
- Directly tying production efficiencies to fiscal reporting

Figure 5 shows a graphical OEE report.


LETS Line Efficiency Tracking Software
Honeywell
Interval Totals
OEE
Availability
Performance
Quality
Time
Running
Planned
Unplanned
Production
Good Parts
Scrap
4/8/2007
4/9/2007
4/10/2007
4/11/2007
4/12/2007

OEE Summary for Press 04

Report Period		Interval Desc
4/7/07 12:01 AM	4/12/07 12:01 AM	Day

Daily Details
4/7/2007 12:01 AM — 4/8/2007 12:00 AM

OEE	(Percent)
OEE	28
Availability	34
Performance	81
Quality Rate	100

Time	(Minutes)
Total Time	1,439
Downtime (Planned)	80
Net Available	1,359
Downtime (Unplanned)	893
Operating	466

Production	(Count)
Good Parts	20,696
Scrap	80
Total	20,776

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Figure 5 – OEE Report

Scheduling

It is often said that production scheduling is more an art than a science. In order to effectively execute a manufacturing plan, the person doing the scheduling in a production environment must have a keen insight into any hidden inefficiencies, as well as an intimate knowledge of how well each machine runs each part that must be produced. Given enough time, a well-designed data collection system can provide you with an unbiased version of this set of “tribal knowledge”.

Over time, your data collection software will measure the production rate for every machine as it produces every part. In addition, it can track the changeover time for each machine as it changes from one part to the next. This data becomes more accurate the longer the system tracks it.

Given this information, the data collection system can accurately predict when jobs will be finished. By adding in changeover time, as well as applying the measured efficiency to the quantity of parts that are required for a run, the software can indicate the time and date of completion for any job in the schedule queue. The software can indicate when exceptions occur by simply comparing the estimated complete time/date to the due date for the job.

Event Logs

Have you ever wondered what exactly led up to a catastrophic event in a machine on 3rd shift? An automatic data collection system can tell you. Many systems create “event logs”. An event log is a time- and date-stamped list of every event that occurred on a machine. These are invaluable when you’re trying to troubleshoot or find the root cause of a problem on a machine.

Conclusion

Turnkey automatic data collection systems can reliably collect timely, accurate, and unbiased data. These systems take advantage of your existing network infrastructure and have the ability to gather valuable production data from virtually every machine in your shop. Once collected, information is stored in a scalable database and is available for use by your other business software.

For More Information

For more information on Honeywell solutions,
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