LIFE SCIENCE MANUFACTURING

LEANING THE BATCH RECORD PROCESS

BSM

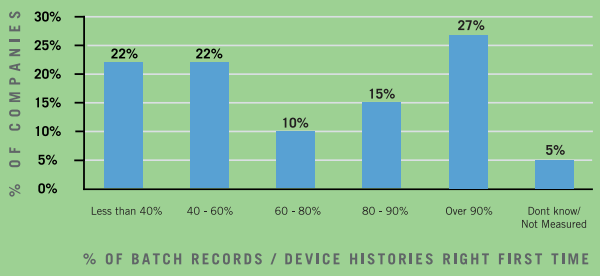
THE PROBLEM WITH BATCH RECORDS

Life Science manufacturing operates in a highly regulated environment and significant effort is expended in compiling and reviewing batch records.

In fact batch records consume substantial amounts of operator, supervisor and dedicated reviewer time. Despite this, long lead-times for approval of the batch documentation and poor 'Right First Time' (RFT) performance are very common. In addition, there is often a small 'cottage industry' built up around the correction of errors.

Some companies have addressed these issues by implementing an Electronic Batch Record (EBR) but for many the cost and complexity involved makes this option unfeasible. All is not lost however - batch record lead-times can be significantly improved by re-engineering the manual review, approval and error correction processes; and RFT can be significantly improved by re-designing the batch record itself.

Manual Batch Record Right First Time Performance - All Respondents



Source: BSM's 2007 EBR Benchmarking Report

WHAT WE OFTEN FIND IN BATCH RECORD PROCESSES

NO REAL OWNERSHIP FOR DOCUMENT ACCURACY

We often find that manual batch record processes are mature and stable with static levels of performance over several years. Long lead times and poor document accuracy have become the 'norm' and are accepted.

Often, there is no real ownership or understanding of document accuracy performance at operator level. This is somewhat understandable given that document design is often poor and unintuitive and that the lead-time between an operator completing a record and a 'return' for correction is typically very long.

LARGE AND OVERLY COMPLEX BATCH RECORDS

Master batch records often have a significant amount of unnecessary duplications and transcriptions. In addition they tend to get larger and more complex over time with all sorts of spurious instructions and additional data requirements being added over the years. This is quite often as a result of CAPA (Corrective And Preventative Action) initiatives. However, the records often do not accurately reflect the current manufacturing process. It is typical to find lots of redundant entries, and entries not in the same order as the actual process. This complexity and inaccuracy increases the risk of errors. Every manual entry is in fact an opportunity for error and master batch records should be revised regularly to keep pace with process changes and to minimise the overall amount of data entry required.

INEFFECTIVE INTERIM REVIEWS

In many companies, document reviews by a dedicated manufacturing resource or supervisor (or both) are added in an effort to improve the RFT at the formal QC/QA check. These 'interim' reviews rarely work well, with a significant volume of errors still getting through to QC/QA. They also add substantially to the overall lead-time.

QUEUES, BACKLOGS AND LONG LEAD-TIMES

It is not unusual to find queues and backlogs before each of the review stages in a manual batch record process. It is also typical to find queues and delays associated with the error correction process. This creates long lead times and high levels of 'Work In Progress' (WIP). High levels of WIP inevitably lead to a lot of non value adding effort being expended in managing, prioritising expediting and tracking batch records through the process.

AVERAGE LEAD TIME (IN CALENDAR DAYS) FROM COMPLETION OF MANUFACTURING UNTIL BATCH RELEASE

Sector	Average	Max.	Min.
Bulk Pharmaceutical	20.2	120.0	5.00
Finished Pharmaceutical	19.2	120.0	2.00
Medical Device	23.7	56.0	1.00
Biopharma	23.7	40.0	6.00

Source: BSM's 2007 EBR Benchmarking Report
Average of all respondents = 21 days

UNWIELDY, SLOW AND PUNITIVE CORRECTION PROCESSES

Errors detected at the QC/QA review are normally routed back to the originator for correction. Often these are accompanied by complex CAPA type paperwork and may involve supervisors and managers in investigations and corrective actions. This can result in significant delays and there may be additional delays waiting for a particular operator to come back on shift, etc.

The delay between the record being created and being returned for correction often means that 'the trail is cold' and the investigation and corrective actions become paperwork exercises. Clearly a faster 'flowed' process is required.

ERROR TYPES AND CAUSES

There is a surprising commonality amongst life science companies in the type and ranking of manual batch record errors. The top error type is almost always 'errors of omission' (in which the required information, signature or 'N/A' is simply not filled in). Poor layout can make it easy to miss data entry requirements and this type of error is more likely to occur when the batch record sequence does not match the actual process. A lot can be done with batch record sequencing, layout, shading and the use of data masks to reduce the propensity for errors of omission. Reducing the overall volume of manual entries, by removing unnecessary and obsolete entries and consolidating remaining entries wherever possible, will also help.

The second most common error type is 'transcription errors' (where data is transcribed incorrectly into the batch record from labels or print outs, etc). It is often possible to eliminate the need to transcribe the data at all by re-engineering of the batch record or the source material or both.

Another common 'error' category is 'inadequate or unclear entry or comment'. This is almost always because the operator does not understand what detail the reviewer expects or needs. A review process which puts the reviewer in direct contact with the originator in 'real time' will short circuit this issue.

SOLUTIONS

THE KEY LEAN PRINCIPLES OF FLOW AND WASTE ELIMINATION APPLY BUT MANUAL BATCH RECORD PROCESSES ARE NOT THE SAME AS MANUFACTURING AND A GENERIC APPROACH WILL NOT WORK.

REDUCING LEAD–TIMES

To achieve fast and consistent lead-times, queuing before reviews must be eliminated. This requires the review workload to be 'level loaded' and matched with available review resources. Batch records should also flow between review stages and errors should be corrected without delay. This may sound impossible but it can be done. One method to combine these requirements is via ***Real Time Review™*** by which the records for active batches are incrementally reviewed during manufacturing (every batch every day). This avoids queuing altogether and error correction is normally instant. Reviewers also get to communicate the standard of entry required directly to operators in real time. Given that the number of concurrent batches is normally limited by the number of rooms, lines or reactors, the workload is often inherently level loaded. There are many variations on this theme and the ultimate solution will be somewhat different in each company.

Obviously the batch record would need to be re-engineered to support a flowed process. If this needs to be done anyway, the opportunity should be taken to redesign it to reduce errors as well. If errors can be reduced sufficiently, the interim reviews can often be eliminated thereby reducing costs and lead-time.

REDUCING ERRORS

Re-engineering of the batch record should begin with a rigorous examination of the data required followed by the removal of unnecessary and obsolete entries and consolidation of remaining entries wherever possible. **Every manual entry removed further reduces the risk of error.**

Batch records should be designed to match the actual sequence of the manufacturing process avoiding any need by the operator to skip backwards and forwards through the batch record when filling it in. It should also be redesigned to reduce the actual effort required to complete it. Data masks, shading, and good layout should be used to help prevent errors of omission.

SAMPLE BATCH RECORD DESIGN

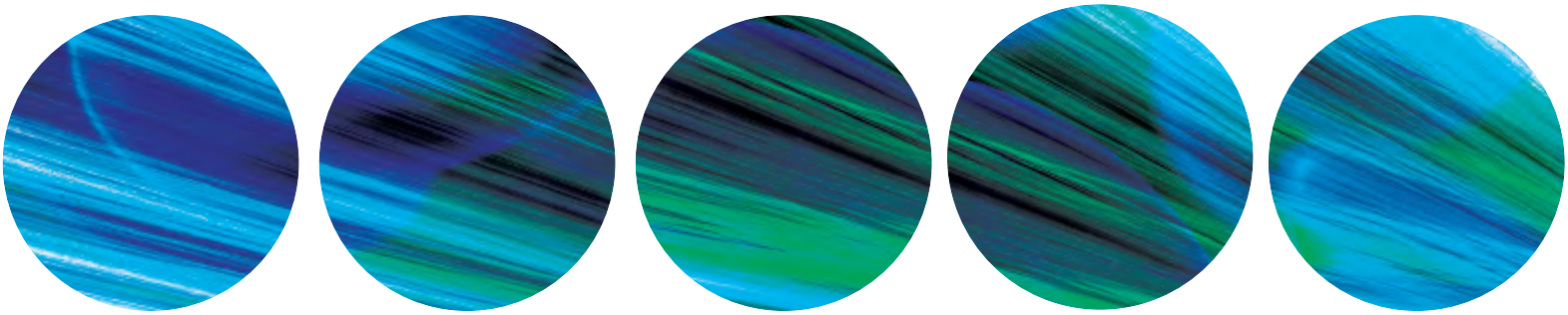
BEFORE

STEP#	OPERATION DESCRIPTION		DATA	INITIALS/DATE
5553	Allow the transfer lines to cool to ambient temperature, then transfer **62.5kg +/- 2.0kg** of the **(509-01020) Amino Acid Feed Solution** to the fermentor **based on the increase in weight of the fermentor.**	Fermentor Weight Before Transfer: Target Weight = Fermentor Weight before transfer + 62.5kg = Fermentor Weight After Transfer: Net Addition = Fermentor Weight After - Fermentor Weight Before =	_____ kg _____ kg _____ kg _____ kg (60.5 – 64.5kg)	

AFTER

STEP#	OPERATION DESCRIPTION		DATA	INITIALS/DATE
5553	Allow the transfer lines to cool to ambient temperature, then transfer **62.5kg +/- 2.0kg** of the **(509-01020) Amino Acid Feed Solution** to the fermentor **based on the increase in weight of the fermentor.**	Fermentor Weight Before Transfer: Target Weight: Fermentor Weight After Transfer: Net Addition (B-A):	(A) ☐☐☐.☐ kg +62.5 kg = ☐☐☐.☐ kg (B) ☐☐☐.☐ kg ☐☐☐.☐ kg (60.5 – 64.5kg)	____ / ____ INT / DATE

The use of shading makes data entry points more visible reducing the risk of 'errors of omission'. It also makes the batch record easier to review. The use of data masks indicating the number of decimal places required avoids format errors. The use of these and other error reducing strategies combined with good general layout and sequencing and a reduction in the overall volume of entries will significantly improve RFT performance.



CONCLUSION

Life Science Manufacturing has always put significant effort, resources and cost into its manual batch record processes. Despite this, Right First Time performance and lead-times are almost universally poor. Occasional improvement initiatives may lead to temporary improvement but performance generally returns to former levels once the focus is "off". What is needed is a more radical approach which re-engineers the fundamental processes (and the batch record) based on key Lean Principles. Batch Record processes are not the same as manufacturing processes and careful adaptation of the Lean techniques is required.

An Electronic Batch Record (EBR) is probably the ultimate solution but the complexity and costs involved determine that it is not currently a viable solution for many companies. The good news however is that careful re-engineering of the manual processes will deliver major reductions in lead-times and costs. Improving the layout, sequencing and formatting of the batch document itself and eliminating unnecessary entries will significantly improve Right First Time (RFT) performance.

If a manual batch record project is to be successful and delivered within a reasonable time frame, it is necessary to resource it properly. This should include significant senior management support and the use of external consultants with a relevant track record and excellent project management skills. Obviously this costs money and a clear ROI (Return on Investment) and measurable project objectives should be established prior to embarking on a full project.

To discuss any aspect of this briefing or your own batch record project or plans please contact:
TOM REYNOLDS, Operations Practice Director, E: tom.reynolds@bsm.ie

BSM is a leading management and technology consulting company working in the Life science sector. We assist companies to deliver significant measurable improvement across a range of manufacturing, testing, documentation and business processes. We develop innovative solutions via the application of best practice lean, re-engineering and change management techniques. We have an extensive track record of successful implementations.

Ireland
Parkmore Business Park West, Galway
T: + 353 (0)91 746900 **E:** info@bsm.ie **W:** www.bsm.ie

UK
11-15 Betterton Street, Covent Garden, London, WC2H 9BP
T: +44 (0)207 470 8766 **W:** www.bsmconsulting.co.uk