

The use of equipment checklists - an emotion-packed discussion

By [John Crossan](#) • on March 5, 2009

Over the years, I have spent (as have many others) much time in discussion/debate/argument in plants over the use of checklists for equipment changeovers and start-ups. I have explained, reasoned, rationalized, cajoled, appealed, beseeched, entreated, implored, pleaded, urged and even cried real tears in my efforts to get people to use checklists.

So it was great to find [discussions](#) lately referencing a recent study published in the New England Journal of Medicine that found (amazingly) that hospitals using checklists in their operating room procedures suffer a much lower death rate than those that don't.

I was glad to see the study, but my very first reaction on reading it was outrage, along the lines of "Operating rooms don't routinely use checklists? What?" Hopefully the study will ratchet up awareness and perhaps drive some improvement. (This also gives some idea of the opportunities we really need to start realizing in the medical system.)

But experience has absolutely convinced me that there is something in the human psyche that fights back desperately against using checklists.

"We need to get things done quickly. Checklists will slow us down. We know what we're doing; we've done it a zillion times before." Best intentions in the world. It's just not a correct statement.

Generally, we found on packaging lines that any missed item on a changeover checklist cost us at least 10 minutes of lost time on startup. In several cases, it resulted in some really significant equipment damage, and who knows how many other times there were damage- or safety-related near-misses. Settings that weren't changed, bolts that weren't tightened, clamps left loose – all completely unintentional, done by people who had done it many times before.

Human memory just isn't reliable enough, especially if interrupted to briefly do something else ... or perhaps someone has a question or needs a hand momentarily. Once the mind has changed focus, all bets are off on memory.

A weakening memory in our culture seems to be treated as a real indicator of diminished capability, a sign of oncoming senility, the dreaded "senior moments". (An older friend I play golf with on occasion describes dryly that, in his experience, the older people get, the more of them it takes to have a conversation. With a big enough group, someone will remember what fills the blank that the current speaker is struggling with.)

But human memory isn't a reliable mechanism at any age. We all forget our keys or where we left them or "what did I come into this room to get?" I've seen even the smartest, most capable people I've worked with forget things when distracted.

I can understand why surgeons, renowned for the magnitude of their egos, would resist anything that seems to suggest a compensation for a failing capability. But why then have airline pilots (with at least comparable egos) accepted checklists for many years. (Well, yes, the regulations say they have to, but if you talk to them, they say they just wouldn't even think of operating without them.)

Mike Thomas, an associate who was a Navy pilot and then a long-time trainer of Navy and airline pilots, explains it as just a part of flying. From their very first exposure to airplanes, pilots work from checklists, and a key part of the trainer's job is training in how to use checklists, just as much as training in the actual functions of the airplane.

Similarly in plants, we found when individuals are trained to perform tasks using checklists, they tend to continue using them. The difficulty comes when someone has been routinely performing a task before the checklist is developed. Even if they help develop the checklist, it's still difficult for them to begin using it.

And, of course, we always got the argument that for pilots it's a life-and-death situation (surgeons, too), and the same rigorous practices are just not necessary (and not affordable) in industry. But yet, always, when we started using checklists, things got better and faster.

Well, the simple answer then, of course, is we just make it a requirement for people to use checklists, and if they don't, then there are consequences. (Whatever it takes seems to work for [Jack Bauer](#).)

But if you absolutely insist that people turn in completed checklists, then you'll absolutely get completed checklists, because that's what you asked for. Nothing says the checklist was actually used like it should have been. And unfortunately, that's the story behind much reported checklist use. The requirement was a completed checklist, so that's what we got.

I have looked in many files and seen many pristine checklists and PM work orders, without any fingerprints, smudges or stains, and wondered how people could manage to keep them that clean out on the floor.

North Americans historically are not good at mindless obedience, but we are quite excellent at mindful disobedience, particularly when someone tries to force us to do something for which we don't hold much value. That's the way people in this country are typically wired, and I'm sure it's becoming the case in most other countries these days. We always push the limits, and we don't take much for granted.

(You know just one thing wrong on that checklist, even a typo, negates completely the value of the entire thing.)

We also had to talk about different ways to use checklists. If someone has performed a task countless times, it's not very efficient for them to go step by step through a detailed listing, checking off each item as they do it. In that case, it's OK to perform a small group of related tasks, then check them off. But it is never, never, never OK to perform all the tasks, then check them off. (Gee. Did I do that one or not?)

I have counseled people, "Why do you want to stress yourself, taking the risk of forgetting something? Why even try to remember? Use the checklist." This is all about getting equipment started up and running well, as fast as possible, not completing mental improvement exercises.

Who deserves more respect – the person who uses the checklist, completes the changeover perfectly and the equipment starts up and just runs, or the person who manages to do almost all those steps completely from memory and then we burn time trying to get started?

If you want to win trivia games at home (or in bars), maybe even compete on Jeopardy, or otherwise exhibit incredible memory prowess, that's great. But memory gymnastic demonstrations don't help us with more effective, efficient equipment changeovers or startups.

(I remember a plant where the qualification requirement for operating a piece of equipment was to be able to change it over completely from memory. This was a big piece of equipment with way more than 100 steps in the procedure. I got blank stares when I asked why?)

So, what actually works?

- The use of checklists has to be mandatory, beyond debate. Just like safety glasses, ear protection, lockout safety, etc., they're part of the job. But it takes much more than law-and-order enforcement to get successful ongoing use (see mindful disobedience above).
- You have to work with people and train them to do the job using the lists. Then it's a routine, essential part of the process, and they get over the idea that it's something extra, that it's slowing them down.
- You have to actually be out there, making sure that everyone has his or her checklist and is really using it, and finding any issues with the lists.
- We found laminated plastic checklists and grease pencils worked best.
- Changeover follow-up meetings identify where people are struggling with the checklists, and identify time loss due to improper use. But we're looking for improvement, not blame. Blame tends to get you back again to mindful disobedience.
- You must have active, participative processes to continuously improve changeovers and startups that include keeping the checklists current and building ongoing ownership for them. It's always amazing how ownership makes the whole process just so much easier.

This means constant work for team leaders, supervisors and managers, but it's an essential part of their job. And most importantly, they themselves really have to believe that using checklists is the most effective, efficient approach.

It is really neat when more and more people become advocates.

What are your stories (pro and con) of checklists at your workplace? Respond to this blog site and let's get the conversation flowing.

Discussions

By Bernie price on [March 5th, 2009 at 10:13 pm](#)

John

There is a comprehensive science / methodology called “error proofing” and several companies who are proponents of it.

The current if not accepted GURU is professor James Reason of Manchester university but there are many others in the field. You and I arrived at the same point from similar directions.....We know that a lack of “Operational Accuracy” is the main road block to achieving “World Class” performance. It is not all the other maintenance related issues we have worked on for so long.

Bernie Price - Polaris Veritas Inc

By [john crossan](#) on [March 9th, 2009 at 9:12 am](#)

Bernie

Thanks for bringing up mistake proofing. It’s a key part of the ongoing continuous improvement of changeovers and startups. Eliminating adjustments, centerlining to identify repeatable settings that are made simply to fixed stop positions. Visual indicators and color coding to easily determine if things are in the right place. People really get into this and own it.

Also just found recently published investigation into the crash of a Marine F18 in San Diego some months back

<http://www.latimes.com/news/local/la-me-miramar-jet-crash4-2009mar04,0,1947853.story>

found among other failings (including maintenance) that the pilot and his advisors failed to follow steps in a safety checklist that would have prevented flying a crippled plane over densely populated areas. This has ended the military careers of a number of those responsible and their superiors. (and four people were killed).

By Ron B on [March 12th, 2009 at 6:31 am](#)

The routes should have equipment with “I-Buttons” to verify compliance.

Data collectors to have ID for route only.

Random checks are essential by team leaders.

Any variance to normal trends must be checked by another.

Publish findings that have “saved” production and cost savings announced.

All w.o. follow up to be published and tracked.

By [Bernie Price](#) on [March 12th, 2009 at 6:58 am](#)

I have my clients use hand held data collectors while they are doing field inspections. The DMSI company who makes them, have software which will point to “The Pencil Whippers”. It produces reports which condense the results allowing a maintenance or operating manager to see exactly what is happening. The resulting transparency is the only stick needed.

By [Greg Buscarello](#) on [April 9th, 2009 at 8:58 am](#)

I have been teaching alignment (among other subjects) for over 20 years and one of the most important concepts is the pre-alignment checklist. While every student would agree (at least by

the end of the class) that such a procedure is a good idea, the percentage of those who will be using it on a regular basis a year later is very small. The difference comes from the expectations of management and supervision. Once they agree that the procedure makes sense and ideally have an input on the details of the list, they need to be told that to skip it is not an option. The buy in from the mechanic must happen first through training and involvement in the process, but after that a clear message must be given that "we're serious about this!"

By [john crossan](#) on [April 9th, 2009 at 8:17 pm](#)

Absolutely. Not an option, and managers and supervisors need to make that clear and actually have to be out there making sure checklists are being used. That's really the only way to do mandatory. It's really just another aspect of safety. But there's always selling. Have to change the attitude that "Real men (and women) don't use checklists".

By B D PAWAR on [May 25th, 2009 at 1:49 am](#)

Error in operation or maint. ultimately results in to loss or waste. It is necessary to have a system that could result in to min. efforts to get maximum output with maximum accuracy. The "Check List" with practically important parameters will result in to good outcomes. Most of us fail in preparing correct check list and unable to train subordinate about importance and use of check list.

Needs to prepare interesting check list which shall be usable to improve reliability of equipment in long run.

By Dibyendu Mukherjee on [June 3rd, 2009 at 8:21 am](#)

Most important thing about check list is that it enables condition based maintenance(and avoid time based maintenance), also reduce cost of maintenance. It also enable one to know his/her equipment very well.

By TimT on [July 24th, 2009 at 8:50 am](#)

Very good discussion. Coming from a military background working on fighter jet engines, we always used checklist then had a inspector go over our work. I'm trying to push checklist now and it is hard for most because they never had it. Biggest response is "I've been doing this for over 30 years" Management and Supervisors need not just a buy in, but actually be trained themselves to understand the importance so that it's not just a "temporary fix" but something that has to stay, has to be continuously monitored and improved, just like reliability and training.(which is another story) I've been doing this kind of work for over 35+ years and it's really sad to see how our "craftmanship" is steadily declining. So many people just come to work, do their time and go home.(kinda like prisoners) Our craft Pride is dying so it up to people like you to keep these blogs going. Maybe through this we can keep our jobs at home.

By Carl on [August 19th, 2009 at 11:39 pm](#)

Very interesting discussion here, tackling exactly one of the issues im dealing with right now. Im freshly graduated from university and have taken the role of maintenance engineer in a rapidly growing company. We completed our third factory last year and by the end of the year we should have our 4th up and running.

I am all for the checklist mentality because even in my little experience (3 years) I have seen several hours wasted a week from incorrect settings, incomplete assemblies etc. However my dilemma is how to implement these checklists and what to do with them. I will have to resort to

the more experienced operators to be able to get a complete list for each machine and obviously add my own input with regards to good practice. I've won the management over with this idea just by showing them the figures of down time but now im at the critical stage of kick starting this new procedure. I like the laminated checklist and grease pencil idea, ive used it in other places and it works. However are the operators simply expected to tick off what they have done? Will this then hold them responsible? The feeling I have gotten from the operators is that these checklists will be simply a measure for management to "cover their asses" and be able to pin the blame on the "poor operator" in the event of an oversight.

Another dilemma is whether i should believe the system i develop is good and implement it throughout the facilities or should i test run it on a couple of production lines? Both have their pros and cons...

I'd like to draw on your years of experience to help me out here! We do learn from our mistakes but im a firm believer of learning from others' mistakes too!

Thanks