Summary

Any industrial facility where automation or automated process is involved will apply routine plant checks, also called routine walk downs or operator rounds. These plant checks shall contribute to condition monitoring and early detection of technical issues, damages, leaks or other failures. Upon detection the technical or maintenance team will be informed ideally in an ERP system to interact. It is very important for the business continuity to achieve an approach which allows such interactions without unplanned business interruption. The better the approach is organized and followed up the more reliable the business continuity will be.

Global digitalization has formed many processes from manual or analogue to digital, from paper to computerized databases. Still tough many industrial facilities use printed check list forms (ranged from 10s to 1000s of check points) to perform their routine plant checks, either shiftly, daily, weekly or monthly. This paper forms are filled out by operations or technical personnel during their walk downs in a systematic or geographic order. They walk around the facility and turn the pages of paper forms to fill the sections with values and findings. They evaluate these either immediately with their experience, with pre-defined limits visible in that sections or later by analysing these forms.

Completion of plant checklists are generally followed by visual control, reporting, work order creation & action on unusual findings. Some companies manually type all list inputs to an Excel sheet for recording purposes.

XPSOES LLC’s www.PlantCheck.net digitalizes and mobilizes this process by making use of today’s mobile phone technology, their cameras, their connectivity (WIFI, USB) and scanning features (QR code, NFC). This white paper focuses on the added values of digital mobile plant checks with NFC reading.
How is mobile plant check working in practice?

The operator takes the mobile phone, clicks on the check he wants to start and walks out. He doesn’t have to follow a certain path, he approaches a check point reads its NFC/QR tag. The check point, its recent values, actual notes/warnings, value limits appear on screen. He puts in the value or the condition and either scans the next check point or clicks on the arrow button which is structurally ordered. He makes photos, videos or notes to a certain check point. This information relation will remain. Whenever this check point is later analysed the photo/video/note will appear. The system allows to skip ‘out of order’ equipment by setting. Missing check points total and of groups are shown on screen. When the round is completed the information is transferred to the server database either via WIFI or USB connection, if the plant doesn’t allow WIFI networks.

A Value is already created when check lists are used. http://atulgawande.com/book/the-checklist-manifesto/

Using today’s mobile digital technology creates additional value, and even more than that the increased usability range of the created value with much less effort. This will be further explained in the following paragraphs.

Mobile device lifetimes are pretty short, since they are moved around, they can fall, contaminated with dust/dirt etc. leading to malfunction. Even physically protected rugged cases can fail to function after 2-3 years. Can anyone of us remember exactly and in correct order all the mobile phones we used and gave away? Digital plant checks with mobile devices are offered from different companies. Most of them force customers to use the supplier’s specially designed, modified exclusive mobile devices. These devices can be expensive, difficult to find in the market and difficult to repair or to replace. They also suffer from becoming obsolete much sooner than expected, running on old, not supported operating systems. Unfortunately many power plant owners suffered from this experience: Since the mobile device is essential for the whole digital plant check system, its fail leads to scrapping of the complete package including stationary hardware and software worth up to 100k$ or sometimes even more. This is one important reason why many industrial utility owners decided to go back to plant checks in paper forms. They don’t want to suffer again from a malfunctioned mobile device leading to complete fail of digital plant check approach. Customers have to prefer Suppliers of digital mobile plant checks who focus on the software and give freedom to select any ordinary mobile device easily available in the market, to select any server computer hardware (standalone or virtual server) and to select which databases to be used. The system will be failsafe, since all components can be easily replaced when needed. Accordingly Suppliers like XPSOES LLC have to convince their potential customers that this risk is out of the table since their solution is focused on software which can be transferred easily from a defective hardware to a functional hardware. The company XPSOES LLC offers with their product www.PlantCheck.net digital mobile plant check such freedom. Customers are free to select which server database shall be used, Oracle or MySQL. They can also select with this their cost. Server databases offer almost unlimited data capacity.

Today environmental awareness plays a higher role than in the past and will play an even higher role in the future because caring about the environment matters. Email printouts are minimized but paper forms are still used. Every shift/day/week/month the same template form is printed out and archived afterwards. Doing the operator rounds with a smart mobile device, uploading the data to a server database saves millions sheets of paper – and money.

Mandatory archiving and keeping the history for future needs requires space to file the documents. Digitalization helps to reduce dusty files and shelves, archive rooms get smaller and
any virtual or physical server computer to run the Plant Check Web Application. XPSOES LLC customers have the freedom to use any mobile phone or tablet running Android. If the mobile device fails, the customer goes to the nearest phone supplier and buys a new one, installs the software to the new device within a minute and starts the next plant check...

A picture tells more than 1000 stories says a German proverb. In paper form checks, photos and videos can be made as well, but the correlation to a specific tag or finding has to be arranged manually by renaming or creating shortcuts. Digital plant checks inherit photo/video functionality at each check point and so the correlation is automatically set.

Applying digital mobile technology and server database communication like Oracle or MySQL in plant checks allows operations and maintenance engineers comfortable access from anywhere to the check readings. They can do their engineering analysis, trend graphs from their office desk or even from abroad if their company policy allows this. This is very helpful when process controller data is reviewed and verification or counterchecks are necessary with local gauge- or visual check data. There are many experiences shared by peers of industrial facilities where on line access to plant check list with photos has helped them to find root causes of problems. For example a gas turbine fuel gas control valve closed unexpectedly several times during operation causing forced shut downs. Root cause searching revealed that the valve drive hydraulic system pressure setting was done with a defective local gauge. A look to the hydraulic gauge plant check readings graphic trend on the Plant Check Web Application© (www.plantcheck.net) has shown that the pressure values changed slightly in the past, but stuck from a certain time onwards, even when the hydraulic system was shut down. The gauge was then replaced with a pressure transmitter.

Searching and finding information in digital databases is much less time- and effort consuming than on paper files. While searching in paper certain rules have to be followed, like row by row, column by column or date by date, server search gives total freedom by free text search or specified input search (filtering options to date, tag, description etc.). This saves staff’s time and effort.

Filtering check lists to show only alarm levels, unusual equipment status or check point with pictures is not possible in paper forms. While database filtering is very easy by simply selecting date range and applying filters, check lists put in in Excel allows also certain manual filtering or semi auto filtering with programmed macros. Such overview windows allow engineers and supervisors to quickly evaluate issues for the selected period, or even future outlook how they will evolve. This allows intervention planning without business interruption (unplanned business interruption is a nightmare for process inherited industrial businesses).

Analysis and engineering work at the location is also possible by creating and viewing trend graphs on the mobile screen. This helps the technical personnel to do a first analysis at the point of check location, which allows immediate intervention if necessary. This is an important contributor helping to
increase reliability. That’s why XPSoES LLC uses the term “Operator driven Reliability”. If a value or a condition ‘out of limits’ is entered to the mobile device, it will turn to a different colour indicating necessity of further actions at the time and place of finding. Such automatic evaluation is not available in paper forms. In ‘afterwards typing’ Excel such evaluation is executed at least hours after the initial finding, back in the office.

Routine plant check duty is for some people not the most fascinating job, since it requests visiting the same locations and areas every day or even every shift. Not trying to blame anybody, it “may” happen that sometimes these check points are not really visited. Instead, similar previous values and status conditions are just copied to the new column of the actual shift. Even when the duty is requesting the employee to do his operator round at 3a.m., such cheating is not acceptable and not just jeopardizing trust and team work, but also the process system continuity. The aim of making physical visits to those areas mandatory may not just to get the readings, but also to visually check the area for unusual vibrations, noises etc. which might be an early indicator of a defect. Digital mobile plant checks can avoid such “trials” by setting certain or all check point local NFC or QR readings mandatory. If set so scrolling to those check points is not possible with the arrow keys, they have to be scanned with the NFC or QR reader to get marked as “completely checked”. On the web application such missed mandatory scanning points is clearly visible.

Only mobile digital plant checks provide an effective control to ensure check points have been really physically visited.

An industrial facility has often more than just one type of check lists. Other than plant check they may also have maintenance check lists, control room checks, health and safety equipment check lists, security checks etc. This means even more paper forms and in case of ‘afterwards typing’ even more Excel input work. The problem with paper and archive accumulation mentioned in previous paragraphs in this white paper becomes a bigger issue. Such checks should also be done in digital check lists to benefit from digitalization. When the digital mobile check application is modular like it is in www.PlantCheck.net, it can be easily done by adding further modules to the same application. It is up to the customer to use the same mobile device or acquire additional devices (if different check modules are to be used simultaneously).

Experience has shown that some industrial facility owners prefer to leave out NFC or QR tags and approach check points just with arrow or plant selection keys. Asked about why, they answer like “too much effort”, “tags fall off”, “tags are too expensive” or “too difficult to make”. Having generated NFC/QR codes from the mobile device and web application I can say with confidence that it is not as feared. Tags can be programmed within hours and placed to the check points within 1-3 days. There are high quality sticker tags available in the market which cost less than a dollar. Providing examples and references will convince customers to go that way and benefit from check point visit local reading mandatory control and easy navigation.
Conclusion

Replacing paper form plant checks by digital mobile solutions is highly advisable to industrial facility owners like but not limited to power plants, refineries, oil/gas platforms, cement factories, car/plane factories etc.

Digital mobile check list solutions create additional value and even more usability of the created value.

Some of the benefits to go towards digitalization and mobile solution at works are as follows:

- Capture images & Record Videos (of areas needing attention)
- Checklist formation based on plant configuration and shift selection. If a plant is shut down, it will not be shown on the check list.
- Records are kept in Oracle DB with no capacity issues.
- Android powered (any android phone will work, no expensive special devices necessary)
- Dynamic ON/OFF selection of checks
- Wireless data transfer (no need for cable connection or docking stations) (USB connectivity is also available)
- Support for multiple check modules (All with one app: control room checks, plant checks, H&S checks etc.)
- Web based application (Access from any PC in the same network using a standard web browser, no special software required)
- NFC tag reading (with feature to set local reading on specific locations as mandatory)
- Advanced graphic features both on mobile phone -and desktop display.
- QR code generation for NFC tag writing
- Create check routines at intervals from hourly to yearly