Control Center Audits – a forgotten virtue

One of the instruments that is used in the process industry since a long time to ensure that all the procedures, directives, activities and targets concerning the operation of a plant are handled adequately and efficiently is the so-called Control Center Audit. This is a periodic, very thorough investigation of the full range of subjects that are relevant to plant operation. In the past, often highlights from such audits have been also reported in magazines in order to demonstrate their fruitfulness or to show some outstanding results. But over the last ten years or so we have experienced that these audits were carried out less and less, hardly anything is published any more and some companies apparently have completely discontinued them.

The question that arises from this development simply is: Are plants and staff today inherently and automatically adapting much better to the ever changing situations and are such measures not needed any more? Or is it just another means to cut costs on a short term basis – perhaps with high chances that the plant may have to pay dearly later for saving some effort and cost now. In essence: Is there still an added value in carrying Control Center Audits out today?

What is a Control Center Audit?

A Control Center Audit that truly deserves that name is a quite comprehensive investigation that encompasses everything that has to do directly and also indirectly with the steering of the plant. Besides that many items that are on the general checklist (some are self evident like the validity of and adherence to safety and operations procedures and standards but others less obvious like work permit procedures, traffic flow through the control room etc.), key items relating to process control are:

- DCS system availability, performance and utilization, spare part situation
- Status of controllers and control applications (number/percentage of controllers on manual, number/percentage of cascades being always open, application service factor,
  documentation etc.) and their performance
- Validity of operating targets (setpoints), constraints, alarm limits
- Number / percentage of disabled alarms
- User interface philosophy and layout, adherence to standards, console / panel layout
- Training plan and status
- Log book entries pointing at problems and the resulting actions.

Audits are typically performed by a team of experienced staff. In larger companies usually also experts from central engineering or central operations support and/or colleagues from other sites are participating. They are typically carried out once every two or three years. The end result is a report describing all the areas looked at, the findings and, most important, the recommendations. The latter ones describe all the actions and changes that can be implemented right away (updating of certain out-dated targets etc.) but also highlight some areas that are showing more general weaknesses and need therefore to be better organized and / or monitored by management, in other words: areas that need increased management attention.

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What is the motivation, what are the benefits?

The prime objective of such an extensive effort is to ensure that all targets, limits, procedures and work sequences etc. are up-to-date, that these procedures are also being followed, that standards are applied etc. and to unveil any area that needs betterment. Thus the key driving forces behind are clearly safety and economics.

The second question is if such an effort is necessary every two or three years? The answer is a simple: Yes! The importance if the factor time is easily underestimated, yet we have to keep in mind that everything that has to doing with operating a plants is subject to change - today even more rapidly than in the past.

Operations objectives and limitations, performance demands, constraints, the technological capabilities and control system capabilities and features, rules and regulations, as well as internal and external standards are subject to constant change over time. And so is the plant and control equipment. As a consequence, the design and the set-up of controllers and control schemes is effected by these changes: Controller tuning may not be adequate any more, the chosen approach outdated, entire control strategies may have become obsolete, the documentation even useless because of the many changes and additions and the user interface simply may not take full advantage of the current possibilities.

One of the most typical situations is that targets and limits may shift unnoticed over time. A truly classical example occurred in an oil refinery in the time when the lead content in gasoline in most European countries was reduced step by step. Lead was the cheapest way to meet specifications like the RON (Research Octane Number) and also the lesser known but more difficult to meet MON (Motor Octane Number). Despite changing the catalysts in the reformer reactors and many other measures, it became soon clear that the new specifications only could be reached without significant reduction in capacity by a drastic increase in the reactor temperature – which in turn required an increase in the preheat furnace temperature. This was, however, out of the question as the operating instructions stated a clear and very firm upper limit which was already reached. Some investigations were done but did not bring a resolution. A few month later these difficulties came also up during the scheduled Control Center Audit and the team started to investigate the reasons for that limit. Eventually it turned out that this number was stemming from a time when the original tubes were used in that furnace: But in the meantime the tubes had been replaced twice and the actual maximum allowable temperature was much higher. In the hectic of the plant shutdown and tube replacement work it simply was forgotten to update the operating guidelines accordingly.

This is a certainly an extreme case, but in every audit a lot of discrepancies are being unveiled that otherwise simply would not have been discovered. And sometimes the findings come from an truly unexpected side: In one case an audit unveiled that one plant was charged substantially more for the very same spare parts by the same DCS vendor than another one in the same country. This discovery led to a change in the procurement procedures of that company.

It is the merit of a specific, sharply pointed investigation to unveil such situations. In daily routine and under the ever present time pressure we simply assume that everything that does not draw our special attention in one way or another, positive or negative, is simply by definition “good” and does not need to be scrutinized in more depth. And exactly here lies the danger to overlook on or the other discrepancy.

The daily work load sometimes does not even give enough room for following ***all*** the imposed

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changes and making ***all*** the proper adjustments, let alone to question and validate every target or limit. Besides, a lot of unplanned changes may go by unnoticed: Unlike events that happen in a 'big bang' fashion, changes that develop gradually are not all the easy to spot. This is also true for deteriorations in control and consequently operations performance that can develop slowly and unnoticed over time but may develop eventually drastic dimension.

Furthermore, also operations and control staff changes over time and the current crew may not be fully aware of the objectives of a certain control scheme and the reasons why it was built exactly in that particular, maybe even at the first glance strange looking way. Such uncertainties can quickly lead to a distrust in the application and eventually to its disuse – although the design may be absolutely adequate and the performance really the best that could be achieved under the given circumstances. Here the cure is not the adaptation of the application or even the development of a new approach, but is to re-establish the required background knowledge, may it be by retraining of the users and/or in improving the documentation by not only describing what was done but also ***why*** it was done in such a way.

Are such Audits still valid today?

These are all strong reasons why companies have introduced Control Center Audits in the early seventies. But these audits mean extra effort and cause also quite some upheaval in the control center for some time and that always brings up the question about the cost / benefit relationship. And cost reduction is the big theme of our time. Yet, no matter what the business climate and operating environment is, with every thorough investigation two effects are always achieved:

- Necessities and opportunities are identified that were not known before – the original motivation for the undertaking
- Secondly, the mere existence of such reviews is an extra motivation for everyone to make more effort in keeping things up-to-date.

And there is another positive side effect: Valuable suggestions, proposals for projects and new controls addressing known weaknesses that have been in consideration for a long time but never made it to the top of the priority list are getting after the audit all of a sudden much more support.

It is in the inherent nature of operating a manufacturing plant that discrepancies and deteriorations develop over time, therefore the need for regular checks is a truly general requirement. And in the light of the reduced manpower and with the ever increasing speed of changes in the operating environment one can assume that keeping everything up to date is even less likely to happen that e.g. 20 years ago. On the other side there is the ever increasing need to make optimum use of all resources at all times. Therefore today there should be even more motivation to conduct Control Center Audits in regular, maybe even shorter time intervals than before. So why not reviving this important and beneficial activity again?

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