

The Essentials for High Performance in PPS A Roadmap from the Practice for the Practice

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Process and Plant Safety requires continuous efforts ensuring that the performance is at the best practicable level. In the real world business environment it appears sometimes difficult to recognize the urgency for this – in particular in case performance deficiencies are not obvious and/or appropriate indicators are not available to show trends.

At Bayer top performance in Process and Plant Safety (PPS) has been of high value and interest already for decades and it is even more so today. Our aspiration is to maintain the position among the best performing companies regarding Process and Plant Safety in the Chemical and Life Science Industry. In order to identify areas which allow most efficiently and effectively to improve Process and Plant Safety even further an analysis of the current practice in the Bayer Group was performed. As a result of this analysis measures were identified which were considered key to safeguard the already achieved high level of PPS and to secure further improvement.

The program which was rolled out in its key features in 2010 to 2012 comprises all from a new PPS policy to the implementation of PPS performance indicators and a comprehensive training program. Among the 8 key measures of this initiative are such as

1. PPS qualification for about 25,000 Bayer employees worldwide,
2. A routine to ensure high level qualification of a worldwide group of PPS experts and specialists who lead Bayer's process hazard analyses,
3. A further developed Management of Change process which includes organizational changes as well as technical changes,
4. A system of Key Performance Indicators.

Paper and presentation gives an insight how such an overall analysis can be performed, how the improvement measures and action plan can be derived and swiftly implemented. Key insights and features of the above mentioned four measures as well as remarks regarding all other of the 8 measures will be outlined.

1. Motivation

Bayer has a long standing history of a well-organized, effective PPS approach. I.e. there has been Bayer internal regulation describing how to perform HAZOP / Process Hazard Analyses, there has been a what we call today a Centre of Expertise for PPS which has been highly regarded outside the company for decades, there has been qualification and training regarding PPS etc. etc.. This all goes back to and has been in existence since the 60-s and 70-s of the last century and has been continuously developed and updated further. We faced over the decades our set-backs when despite all efforts severe incidents hit a plant, a site, the neighbours and therewith the company.

However, our aspiration has been and will be to eliminate the so called severe incidents and even to go beyond that. We also recognize that the criteria what is considered "severe" looking from the outside of the company and industry are getting more and more demanding. Thus there was a need to continue to identify effective measures to develop the PPS culture further on the basis what we have implemented and have already achieved. We also felt that it was time to review our approach as a whole again asking ourselves if or how far we get what we expect to achieve. Thus the approach and the Bayer initiative,

which will be described in this paper, is to some extent specific to the company, yet, we are convinced that this approach has many aspects which apply for other companies as well.

In order to be always among the leaders regarding PPS performance in our relevant business the continuous search for improvement opportunities is a must. Be it by learning from the lessons others or the own organization had to learn from incidents or striving based on company internal recognition for better solutions regarding safety. Doing this as PPS- and safety-specialist inside the company would lead to some positive development. Asking independent, company external specialists as well as the in-house managers, engineers and operators of the relevant facilities leads to an even sharper judgement and to more earth bound solutions. At Bayer the Board of Management decided 2008 to perform such a type of study.

2. Approach

The probably most important success factor for the study was how the study was started. The Board of Management requested the Bayer PPS Committee to forward a proposal how to maintain the PPS performance further at top level and to improve further. In other words, the Board of Management was right from the start committed and driving the effort.

At Bayer we operate worldwide several hundred chemical and active ingredients handling or producing sites and an even much larger number of plants and processes. The different businesses of Bayer MaterialScience, Bayer CropScience and Bayer HealthCare come with a different level of risk. Due to the different business the requirements regarding the design of production processes and facilities are quite different in detail resulting in different safety approaches and measures. Facilities are different regarding age and origin – own development, acquired etc. etc.

Thus the examination of all sites, plants and processes of them in a study would require a lot of experts at one time – including external 3rd parties – or unacceptable long time to conduct it. It was decided to select a representative group of sites/facilities. The key criteria for this selection were among some other side considerations:

1. Hazardous materials handled, produced (Hazard level, volumes)
2. Regions / Countries
3. Facility part of a larger chemical park or industrial area versus standalone site/plant
4. Continuous vs. batch/multipurpose facility
5. Original Bayer vs. recently acquired facility (within last 10 years)

As a result 20 different sites with more than 42 plants had to be chosen to cover all the above key criteria.

The study itself comprised the steps:

1. Study existing plant and process material (process descriptions, process hazard studies, P&ID, safety performance data etc.) before visit;
2. Plant visit comprising interviews with the
 - a. Local management (support function and operation/manufacturing)
 - b. Operators, control room based discussion on a running shift
 - c. Plant tour
 - d. Immediate oral feedback to management end of day(s);
Plant visits always with 3 senior PPS experts: 1 3rd party expert, 1 from the Bayer central PPS group, 1 with particular experience as plant manager and/or engineer.
3. Assessing the observations and results compiling a list of areas where a best practice for Bayer was found and where areas with improvement potential are;
4. After all visits and a preliminary summary of best practices and improvement opportunities a workshop with a group of plant managers, engineers and PPS experts was held to create an earth bound assessment and a draft action plan;
5. Implementation of improvement measures.

The visits were prepared with a questionnaire which the study team developed before the site visits were conducted.

The study team had 7 members enabling to create 2 visiting teams with 3 study team members each (see above) and having 1 legal advisor for the teams.

3. The Study Questionnaire

The questionnaire was developed from existing inspection and audit questionnaires. It comprises about 100 questions which focus on 4 main subjects of interest:

1. Safety Culture:
 - a. Organizational set up (structure & processes)
 - b. Management Commitment
 - c. Communication
2. "Resources" (knowledge, availability of tools, budgets)"
 - a. Qualification / Skills / Training
 - b. Knowledge / capability of the organization
 - c. General resources (including PPS toolbox)
3. Documentation (substances, processes, equipment, plant, HAZOP reviews etc. etc.)
4. Management of Change
 - a. General set up, Process (in Operation, Maintenance, Projects)
 - i. Temporary / permanent Changes (Permit to Work process included)
 1. Technical Changes
 2. Organizational Changes

4. Study results

The study showed that the PPS management was on average in good shape. However, the study had the purpose and was designed to detect the potential weaknesses and areas for further improvement: good is not good enough. The study also confirmed what was to a certain extent expected: there are solutions for PPS challenges in the company which deserve the rating "best practice". The improvement program derived from the study is based on the thesis that a first important improvement would be achieved if and when today's "best practice" of one or a few locations became quicker the "normal" practice of all parts of the worldwide organization.

The study team translated the observations into expectations and defined company specific measures thought most effective and efficient to fuel the engine of our continuous PPS improvement at this time:

Eight key expectations and measures to achieve them from the Bayer TOPPS initiative:

Improvement Expectation	Measures
1. Increased awareness for PPS topics and further improved safety culture throughout the entire Bayer Group	Implement PPS study results in form of a Bayer initiative "TOPPS" (Top Performance in Process&Plant Safety); Release a specific PPS Policy and Board of Management letters / presentations and Board of Management letters / presentations; Launch a dense communication program top down in all parts of the organization;
2. Enhanced monitoring and control of PPS performance	Have yearly specific PPS objectives (qualitative / quantitative) for all management personnel involved in manufacturing operations; Quantitative mandatory KPIs on Group Level: in particular Loss of Primary Containment (LoPC), Training Compliance, Status on Process Hazard Analyses. In addition business specific objectives and KPIs;
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3. PPS at least at the same high level of awareness and value as occupational safety	Beside all other elements of the TOPPS-initiative, which contribute by themselves to an increase of awareness, in particular: enhance communication concepts and tools for PPS topics and experience exchange;
4. Volume and degree of detail of PPS regimentation are at required level	Best Practice document published Specific trainings being developed;

5. Appropriate PPS competencies on each level of hierarchy for all relevant positions/functions with any influence on plant and process safety	For each relevant job a mandatory PPS training was tailored based on the specific job requirements and rolled out;
6. Enhanced PPS professionalism	Transform existing PPS Centre of Expertise (CoE) to the one strategic CoE at Bayer; Hiring of PPS experts to extend Bayer internal own PPS capacity; Regional PPS hubs with centrally lead PPS experts and PPS practitioners were created; Bayer community of PPS-Experts and -Practitioners intensified and different experience exchanges enforced (conferences, electronic means, web based solutions, ...)
7. Maintain the desired level of Process & Plant Safety in manufacturing	Necessary organizational structures to maintain the desired level of Process & Plant Safety in manufacturing reviewed, defined and confirmed
8. Prevent potential loss of PPS performance in case of changes in manufacturing organizations or processes and facilities (Management of Change and Permit to Work process)	Updated existing Bayer Group Regulation on Management of Change and Permit to Work process covering technical and also organizational changes

The reader of the above might have already recognized that not any of the measures above do address anything related to “technical installation” of i.e. plant and/or specific safety equipment and/or the “maintenance” and/or “project work” and/or “process design” and/or “level of documentation” etc. etc.. The simple reason for that is, that – except beside a few very plant or site specific items which immediately were addressed after the study visits – there was no indication that this needs as much and compared with the current practice more focus for the overall improvement as the here listed measures.

Reviewing our past near misses and incidents supports this recognition also. If improvements of the above areas are achieved the majority of recent incidents would most likely not have happened or their consequences had been much less severe.

5. Implementation of the key measures

All of the above 8 expectations and measures were considered important for the improvement of the Bayer PPS culture and performance at the time. However, one or the other is more key for the desired development than others. And, the implementation had to follow some basic good practice rules:

First: it was important to create the initiative with high profile visibility. The request for the study from the Board of Management and their continuous commitment was key. Beside other communication activities creation of a name for the initiative which sooner than later everybody was able to relate to turned out to be very helpful. The name and acronym TOPPS – “Top Performance in Process & Plant Safety” was developed for this. An intense and good communication plan and implementation top down and with a rather high frequency of contributions using different media channels is essential for gaining this visible profile rather quickly. The specific action plan for the subject matter items/measures must be used to fuel the communication. This creates the appropriate level of awareness and commitment in the entire organization.

Second: it was important to run and organize the initiative as a project. The project needs a clear objective and focused list of action items (see above). On the organizational side a project lead, a team and a steering group must be appointed.

The already existing Bayer PPS Committee was assigned as the project team creating working groups to handle each measure. The chair of the PPS Committee was appointed to be project manager. The

steering committee chair was the member of the Bayer Group Board of Management responsible for Technology, The steering group comprised Bayer Subgroup and Bayer Service companies Board Members also responsible for Technology / Industrial Operation.

Third: with the project objectives and timelines the demand for resources needed to be defined and the commitment made to have them available. As it was decided to strengthen also the strategic aspect by enlarging the Bayer in-house PPS-resource and –capacity, it was decided to recruit the resources for the initiative itself also in-house as much as possible.

There are other organizational components which are also relevant to create an efficient and effective initiative and implementation but the above mentioned were key for the Bayer initiative.

Assessing the initiative from the point of view and question which one of the measures made the biggest impact among the 8 expectations and the derived Bayer-Measures the most important key-measures are:

1. Clear and very recognizable management commitment,
2. Refresh/renew PPS qualification for about 25000 Bayer employees worldwide in less than 2 years,
3. Establishing a binding routine ensuring the same high level qualification for all members of a defined worldwide group of PPS experts and specialists who lead Bayer's process hazard analyses,
4. Introduction of a system of Key Performance Indicators with regular reporting to the Board of management as part of a KPI oriented continuous improvement process. Including in particular to measure
 - a. the compliance with qualification and training requirements.
As a prerequisite this includes to define the specific qualification/training requirements for each PPS relevant role and to define the mandatory training content and requirements for each role.
 - b. the compliance of having all necessary process hazard analyses (PHA) performed with the people particularly qualified for this task according high Bayer requirements and all PHAs up to date always in time (min. review frequency every 5 years, if not projects/changes require this earlier).
As a prerequisite it is necessary to define which facility, process, plant or installation requires a PHA – which already existed at Bayer – and to create and maintain an up to date inventory of all PHAs and monitoring their status.

With the both above we were able to create “a” Performance Indicator which gives us assurance that the quality of our PHAs is where we want it to be. This is – of course – one of the most important pillars for a top performance in PPS. The “qualification part of it also ensures – beside the need to have a robust process for it as well – high quality of any Management of Change (see point 5 below) and the “normal” daily routine work as well.

5. Update and introduction of the Management of Change process which includes now specific requirements regarding organizational changes as well as the usual technical changes.

6. Conclusion

The Bayer Initiative TOPPS was able to point out the specific areas where internal to the company a true best practice - also compared with external solutions – was already established in the company and to identify the ones which are suited most to improve the PPS culture and PPS performance best.

Visible management commitment, professional communication combined with a set of target oriented – see expectations above – PPS specific measures and actions appear to be suited to develop and/or maintain a high performance PPS culture and performance further.

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