Value improving practices for revamp and greenfield projects in fertilizer industry
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Value improving practices for projects in fertilizer industry
1. SYNOPSIS

AmmoniaKnowHow.com and UreaKnowHow.com support fertilizer manufacturers by providing essential services to the industry, using our syngas technologies and scientific knowledge developed in multiple projects worldwide.

Together we initiate a program to enhance the guidelines and procedures for operation, engineering, maintenance and process safety in the fertilizer industry utilizing the best practices and standards available today.

Using knowledge gained from our industry, historic risk registers, lessons learned from projects and from FIORDA members we are committed to give proper advice to improve safety, reliability and projects performance of fertilizer plants.
2. WHY DEVELOP SPECIFIC GUIDELINES AND PROCEDURES

Guidelines and Procedures are developed to help staff and management teams run the organization. In the best use situations, procedures play a strategic role in an organization. They are developed in light of the mission and objectives of the company and they become the media by which management’s plans, rules, intents, and business and operation processes become documented and communicated to all staff.

Carefully drafted and standardized guidelines and procedures save the company countless hours of management time. Guidelines, procedures and employee handbook should be an important part of the operation. They should be the first thing given to a new employee (either in hard copy or an electronic version). They should also be easily accessible in their most up-to-date version. Hence it is extremely important that an organization’s procedures are a “living document” prepared and saved in Microsoft Word and easily exported into portable versions (like PDF) and made available over the company network.

3. PURPOSE OF THIS DOCUMENT

This guidance addresses the Application of Value Improving Practices (VIP’s) in the project development process. The prime focus of VIP’s is in improving the overall effectiveness of the use of capital spent on projects. When used appropriately, VIP’s apply equally well to small and large projects.

Value Improving Practices (VIP’s) are activities or techniques which are focused on improving the overall effectiveness of the use of capital on projects – both large and small. This improved effectiveness would be reflected by an improvement in the Return on Investment.

For UreaKnowHow.com Revamp Guide refer to: https://www.ureaknowhow.com/ukh2/revamp-guide.html

4. INTRODUCTION

Independent Projects Analysis (IPA), a US based company widely experienced in the benchmarking of industry performance in project execution, recommends the use of VIP’s on small and large project execution as part of a good Front End Loading (FEL) process.

The FEL process is one that ensures that a proposed project is defined sufficiently prior to funds approval and commencement of execution, such that:

- The project has a sound business case and objectives
- The project scope is fully understood and costed properly
- The strategy for execution is agreed to by all key stakeholders
- The project schedule is realistic.

The appropriate use of VIP’s is an integral part of achieving the required amount of Front End Loading.

The list of generally recognized VIP’s is:

- Technology Selection
- Project Value Objectives
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- Process Simplification
- Design to Capacity
- Minimum / Customized Standards and Specifications
- Value Engineering
- Constructability Review
- Plant Reliability, Availability and Maintainability (RAM) Modeling (Life Cycle Costing)
- Predictive Maintenance (Reliability Centered Maintenance)
- Waste Minimization
- Energy Optimization

Risk Management is also an essential process for value addition on a project.

It is not necessary or appropriate to apply all the above VIP’s on every project. The size and type of project is very relevant in deciding the applicability of the VIP’s. If applied “blindly” some VIP’s can be marginal or even negative in their effects (in that the cost of executing them can outweigh the benefits).

The Project Manager will decide on a case by case basis whether individual VIP’s are applicable for the size and type of project in question. Guidelines can be developed by AmmoniaKnowHow.com on the nature and benefits of each type of VIP, and how they should be applied, which will assist the Project Manager in this decision.

5. DESCRIPTION OF VIP’S

A general description of the intent of each of the listed VIP’s is provided below:

6. VIP-01 PROJECT VALUE OBJECTS

This practice establishes what facility or plant is needed to meet investment and business goals. It aims to identify what Investment Objectives and Business Objectives / Drivers, are applicable to a particular project.

Examples of things typically considered are required level of reliability, ease of future expandability, level of automation, life of facility, expected stream factor, social and environmental performance, carbon neutrality, required feedstock and product quality / flexibility.

Assessment of these various Project Value Objectives can then be used to determine things such as design allowances, redundancy, spare parts philosophy and room for expansion.

The objectives determined from this VIP become part of the project premise and will assist the Project Team to make design (and VIP) decisions throughout the project. As such, this should be the first VIP applied to a project.
7. VIP-02 TECHNOLOGY SELECTION

Implementation of new technology is essential to remaining competitive and to being a low cost producer. The Technology Selection VIP is a systematic process. It references a methodology for locating new technology and selecting the relevant technology.

This VIP can be used at several phases in the project for different purposes:

- In the **Identify** (or Business Development) phase it is used to determine if any process technology exists that will produce the desired products. If no suitable existing technology is found, then R&D may be proposed.

- In the **Evaluate** (or Appraisal/ Conceptual) Phase, this VIP is used to identify all potential technologies for the project. This VIP structures the search for generic process technologies that meet the overall objectives of the project.

- During the **Define** (or Front End Engineering) Phase, Technology Selection is used to identify new technology that will optimize the process or equipment. It involves consideration of state-of-the-art equipment and innovative process options that can be implemented into the generic process technology identified in the previous scheme.

- During the **Execute** (or Detailed Engineering) Phase, Technology selection is generally confined to selecting the best equipment on offer from different vendors.

For Deliverables List for Projects in fertilizer industry refer to: 
https://www.ammoniaknowhow.com/deliverables-list-for-projects-in-fertilizer-industry/

8. VIP-03 PROCESS SIMPLIFICATION

Process simplification is a high level review of the overall process or concept to ensure it does not include unnecessary steps, components or features. It involves examining whether steps or components / functions can be combined to simplify the concept.

Another VIP “Value Engineering” (see VIP-06 Value Engineering) is essentially a more rigorous approach of the same concept.

9. VIP-04 DESIGN TO CAPACITY

Historically, many plants have been 20-30% over-designed. Quite often equipment designers add an over-design margin on top of any margins allowed for by process engineers. Vendors may do the same because they want to ensure their equipment meets the requirements. This conservatism leads to extra, undesired capacity and an investment that may be idle.

The VIP eliminates excess capacity from the design. First, the integrated project team determines the over-design capacity factors for the equipment depending on the reliability of physical process data. Next, due consideration is given to the amount of knowledge available on calculation methods, fouling factors, chemical reactions and product streams. Capacity is controlled and safety factors are used judiciously. A key is that the design margins and safety factors, once agreed, are formally documented making it clear:

- What the design factors are
- How they are actioned or implemented.
This avoids duplication and also provides audit-ability and consistency in calculations. It assists in ensuring that consistent design margins are applied for equivalent equipment and systems across the project.

10. VIP-05 MINIMUM / CUSTOMIZED STANDARDS AND SPECIFICATIONS

Engineering standards and specifications can affect manufacturing efficiency, product quality, operating costs and employee safety. In many cases the cost of a facility is increased unnecessarily by the application of codes, standards and specifications that exceed the actual needs of the specific facility to be designed.

Additionally, the customer’s documentation requirements should be reviewed to ensure that the correct amount of documentation is produced and issued with agreed review cycle times. Excessive and / or non-required documentation can increase project costs.

For Deliverables List applicable in projects and operation refer to: https://fiorda.eu/guidelines-list/

11. VIP-06 VALUE ENGINEERING

Value Engineering is a disciplined method used during front end design, often involving the use of a consultant, aimed at eliminating or modifying items that do not add value to meeting business needs. Another way to define non-value-adding investment is that it is non-income producing investment.

Value Engineering is generally one of the last VIP’s to be started. It is not suitable to most small projects. A rough rule of thumb is to use it for projects of not less than US$3 million in value. Mechanical flowsheets (P&IDs) issued for approval (not for construction) are required.

The Value Engineering VIP operates at a more detailed level than the Process Simplification VIP, which involves simplifying the process and does not involve detailed consideration of facilities and equipment. Functions of major equipment are determined and better, low cost ways to provide a function are explored.

Value Engineering may also include the assessment of construction execution strategies to ensure that the lowest overall cost design basis is adopted.

12. VIP-07 CONSTRUCTABILITY

This VIP involves the optimum use of construction knowledge and experience in planning, design, procurement and field operation to achieve overall project objectives. It links the design and construction processes.

This VIP begins in Feasibility and carries through to Construction. It provides a methodology for utilizing ideas and construction experience into the early part of design. A key feature of the Constructability VIP is one or more facilitated Constructability Review sessions involving the Project Team and various people with the relevant construction background.

The Constructability VIP requires a little more effort in the early phases in order to lower the construction cost. Since the entire project cost is greatly impacted by the construction costs, spending more on design and equipment to make construction go faster and smoother usually reduces the overall cost of the project.
AmmoniaKnowHow.com can develop a dedicated Constructability Guideline, Procedure and Checklist specifically for ammonia and urea technology projects.

13. VIP-08 PLANT RELIABILITY AVAILABILITY AND MAINTAINABILITY (RAM) MODELING (LIFE CYCLE COSTING)

This VIP involves the use of computer simulation of processes to explore the relationships between the maximum production rates, and design and operational factors such as quality, yield and production transitions, maintenance practices and requirements, capacity, safety and environmental concerns.

It requires development of a computer model of the process availability. On completion of model development, the following is assessed; the impact of meantime between failures, the availability of individual pieces of equipment, downtime, equipment configuration etc., and the impact on the production capacity of the unit.

AmmoniaKnowHow.com can perform RAM modelling studies used to predict asset performance and optimise the availability and reliability of production systems to maximise Life Cycle Profit.

The modelling uses a sophisticated Monte Carlo simulation to study the effects of resources, operational strategy, variable demand profile, partial operation, and system configuration changes and/or equipment throughput variations.

14. VIP-09 PREDICTIVE MAINTENANCE (RELIABILITY CENTERED MAINTENANCE)

This VIP involves the development of a Predictive Maintenance philosophy and determines the extent of the equipment monitoring and equipment sparing utilized. Predictive maintenance makes use of advances in sensor and instrumentation technology to monitor characteristics such as heat, lubrication, vibration, cracking, noise and presence of corrosion products and consistently incorporates them into the project design.

The result is determination of the optimum level of equipment monitoring such that remedies / repairs are effected prior to failure.

15. VIP-011 WASTE/ EMISSIONS/ DISCHARGE MINIMIZATION

This VIP is driven by regulations, greater sustainability mandates and the desire to be a good community citizen and the desire to conserve raw materials and subsequently reduce costs.

Using this VIP, an integrated team conducts a stream analysis to determine if wastes, emissions and discharge streams can be eliminated and if useful materials can be recovered and recycled. In addition, the team looks for technologies capable of making the waste streams innocuous and looks for alternative processes that do not produce waste streams. The criteria used to determine if a stream is a pollutant and the conclusions about how to handle the stream are documented. This VIP is typically conducted by a group of process and environmental engineers.

16. VIP-012 ENERGY OPTIMIZATION

This involves the systematic computer-based evaluation and optimization of energy usage on a process.
Consider the following regarding the Energy Optimization VIP

- What provision efforts are made in the design to optimize power, heating, cooling components to this project?
- Is a systematic computer-based model evaluation warranted?

17. VIP’S APPLICATION

The fundamental approach for VIP’s is:

- Apply the VIP’s in a formalized way
- Involve appropriate members of the design team, as well as personnel from the customer / operator (e.g. maintenance, operations, plant engineering representatives). Typically, this will be the Project Team plus selected other people who may be specialized in particular fields.
- Formally record the results on either specific VIP “prompt lists” or in a minute of meeting. The first option is preferred as it makes it easier to identify how VIP’s are being applied to projects. The latter is applicable for very small projects (e.g. <$100,000).
- Follow-up and complete the agreed action items.
- Record close-out of items.

For very large projects with CAPEX values in excess of say US$50 million, it may be appropriate to use all the VIP’s and to hold separate workshop sessions for each one. It is very important on small projects to be selective in choosing which VIP’s to apply. More is not necessarily better.

For small projects, the following VIP’s may not be relevant:

- Waste Minimization
- Energy Optimization

It is recommended to generally only consider the use of seven VIP’s for most projects:

- Technology Selection
- Project Value Objectives
- Process Simplification
- Value Engineering
- Design to Capacity
- Minimum Standards
- Constructability Review

18. DELIVERABLES

The output from the application of VIP’s should be similar to the output of a HAZOP, in that there will be an initial VIP Report listing:
• Agreed actions to be implemented with no further study/evaluation required

• Actions where alternatives or options require definition and evaluation before determining the optimum way to proceed.

All items should have an initial action party on initial issue. All items should then be tracked to final close-out.

19. METHODOLOGY

AmmoniaKnowHow.com can develop a series of Guidelines / Prompts to assist in the application of the VIP’s. It is intended that these “lists” be used by Project Managers at the various forums at which VIP’s are discussed. By so doing, the application and outcomes of VIP’s will be easily apparent/auditable, rather than the results from VIP’s being “lost” amongst other project design issues.

20. RESPONSIBILITY

VIP’s Guidelines / Prompts and Deliverables are documents owned by the Engineering / Project department within the organization. They are responsible to develop the procedure for Projects and Facilities to support the delivery of projects.

21. DEVELOP YOUR OWN ORGANIZATION PROCEDURES

Although templates can give you a head start on procedures development, other factors must be considered as you write your own internal documents.

One factor is your organization’s culture. Organizational attitudes toward procedures determine the spectrum. On one end of the scale are companies that have a procedure for everything. On the other end of the spectrum are companies that only have only a few guidelines (only those required by the laws that are relevant to that company). Most companies fall somewhere in between these two extremes. The manager writing any guideline needs to understand where on the spectrum the company it falls and how the policy can be made to fit the organization’s culture to enhance compliance.

Other two factors to be consider when developing guidelines and procedures are the fertilizer technology that company employs and local and international standards applicable to the industry. Internal standards and procedures must be developed in line with these factors, being applicable for your own plants and in line with regulatory requirements.

The last, but not least, factor when developing your own procedures is the best industry practice that you need to employ. Liaison with your fertilizer association, participation in industry meetings and conferences and using fertilizer industry consultants can bring a fresh eye, new ideas and enhance the quality of your own guidelines and procedures.
22. DEFINITIONS

CAPEX  	Capital Expenditure
FIORDA  	Fertilizer Industry Operational Risks Database
HAZOP  	Hazard and Operability Studies
PFD  	Process Flow Diagram
P&IDs  	Process and Instrumentation Diagrams
RAM  	Reliability, Availability and Maintainability
VIP  	Value Improving Practices

23. REFERENCES


Disclaimer

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