

Design Engineering Tools for Chemical Plants

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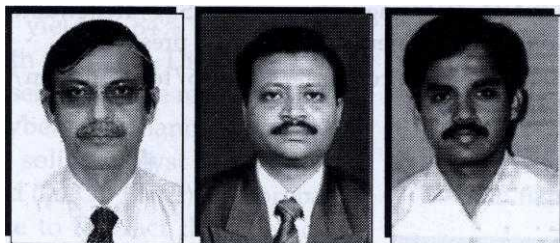
Engineering activities have undergone a quantum jump with powerful computers and latest softwares. The drawing board and the draftsman have been antiquated. With globalisation, through the use of such softwares and IT, multilocation and overseas jobs have become easier to handle from a specified country base.

This article describes how engineering and project work are powerfully enabled using computer aided tools.

The advent of 3D computer systems in the mid-nineties has revolutionised the design engineering activities associated with many industries, including the chemical and allied industries and sectors. The latter has benefited through their myriad features including accuracy, speed, calculations and versatility across databases and systems. There are many 3D systems available in the market today with a variety of features. Choosing the right one is of utmost importance to achieve the desired result. The most commonly used 3D modelling systems in the market are Idea, Catia, PDMS, PDS, Autoplant, etc. Systems like Catia and Idea are used mainly in the automobile industries and manufacture of machined components. The systems which are based on databases are used to cater to the requirements in layout engineering, ship building, city planning, etc. PDMS and PDS are among the more favoured of these systems.

3D systems in vogue

Engineering companies today extensively use PDMS for their projects. Design teams are equally adept in working in any of the 3D Cad systems effectively, and are flexible to implement projects in a manner requested by clients. Projects are also implemented in PDS and Autoplant apart from PDMS. Different 3D Cad systems have been deployed to execute both small and mega-sized projects depending upon project specific requirements. These 3D systems are integrated to other engineering systems for seamless data transfers. The fundamental needs of a 3D software are its versatility and should offer customisation tools that allow users to harness its features in an optimum manner. Currently, PDMS 11.6 sp4 is used in most of the organizations for projects, with a new version namely PDMS 12 round the corner. The sections that follow, mention the various steps undertaken while executing projects.



This article has been co-authored by Rajiv N. Patki - General Manager (*extreme left*), Sudeep Guha - Manager (*centre*) and C J Joshi (*extreme right*) - Executive Engineer in Uhde India Private Limited's Piping Department.

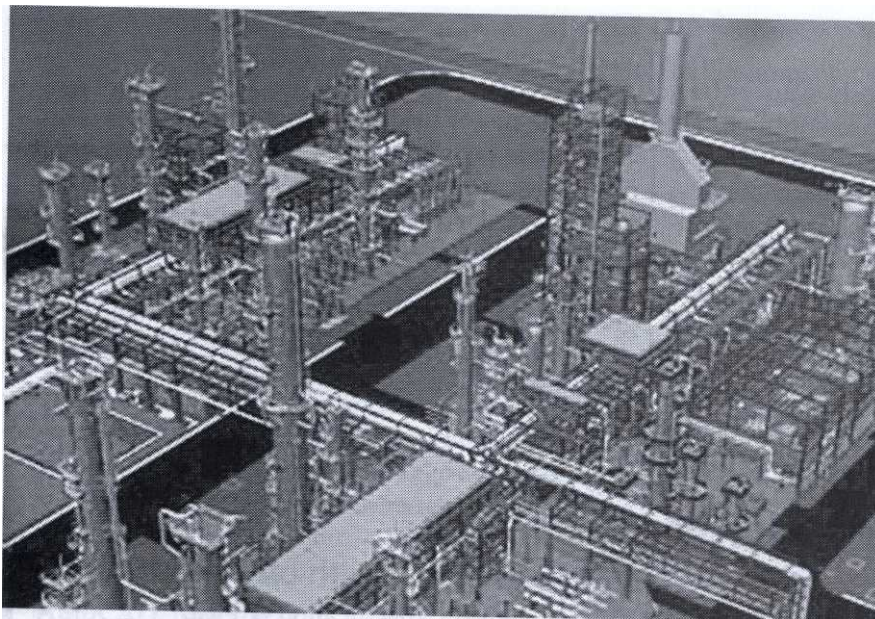


Figure 1 shows a petrochemical plant executed using PDS

Managing and implementation of systems

The chemical plant, as we know, is a complex creation, requiring the utmost care during both design and implementation. Engineering companies today have specialised group dedicated to handling 3D systems. This group is normally, completely responsible for the smooth running of PDMS system during execution of a project. To start with, this specialized group studies and summarizes the project requirements and in accordance with these requirements, the "project" is defined. An administrator then creates the project in the system using the standard master setup available, assuming responsibility for maintaining and managing the project. Responsibilities include definition of users, installation of software, managing databases, managing servers and systems, backing up and restoring data.

Customization of libraries, templates, cataloguing & specification

Various libraries are defined for creating 3D model and extracted 2D data with minimum possible efforts. These are primarily organised in two categories viz. Design and Draft libraries. Experienced users are known to use the "Master project" concept

to implement projects. The concept is the result of a number of years' experience. The experience gained over the years in various projects can be channelised into the development of the master project, which is now used as a base for new projects. The checked data available in this master project ensures error free output for the new projects. Master project also houses a wide variety of component catalogues. This ensures that minimum effort is spent to get the optimum benefit.

Master project also houses numerous draft libraries for drawing symbols, styles and rule-sets which aid in generation of appropriate drawings. Preparation of backing sheet is the only work required in a project.

Thus the master project concept in PDMS not only minimises efforts required in the project, but also ensures right output from the system. Constantly focused on improving its systems, the company invests resources in further refining the master project in the system, so that its client's projects continue to benefit from these developments.

Work sharing and multi-centred engineering

International engineering organisations regularly execute projects for their parent companies, and other business partners across the globe. This calls for sharing of work worldwide (with data security) across different time zones on a daily basis, through dedicated

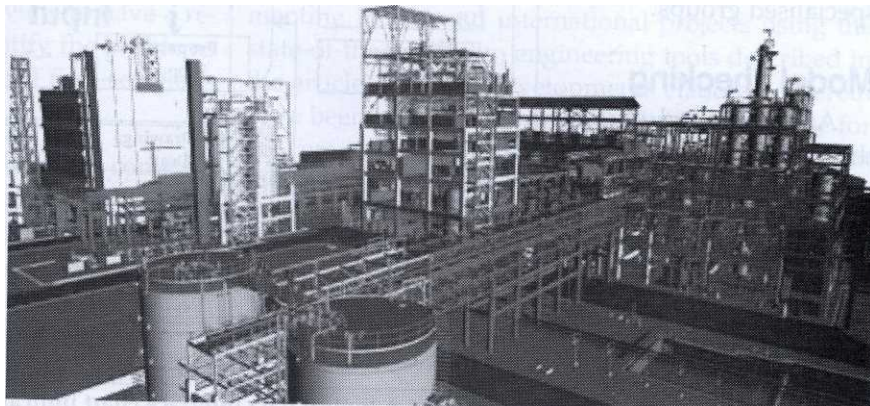


Figure 2 shows a petrochemical plant executed using PDMS

- **Laser Model interface:** 3D laser photographs of plants to be revamped are taken and the soft file generated is converted to an interface file that can be understood by PDMS. There are various options available in the market which convert the laser photography to a file ready to be loaded in PDMS. Photogramary is one such application.
- **Caesar II Interface:** Aveva has developed a new package which extracts a file from the PDMS model of pipe line(s). This file can be loaded directly in Caesar II and analysis activity can be started right away with minimal set-up changes as per project requirement. The modelling and checking efforts in Caesar II are saved. Engineering companies and users can therefore capitalise on the enormous saving potential in this regard and can even develop an in-house interface program.
- **AutoCAD:** Interface with AutoCAD is the oldest of all interfaces. The drawing generated in PDMS draft and Isodraft can directly be saved as dxf format which can be opened in AutoCAD. With a lisp file from Aveva, the format can be made to match with that of PDMS.
- **Steelworks:** This interface is realised by means of SDNF interface file. The file is two-way transfers which makes it more useful.
- **STAAD:** It is observed that modelling of steel structures in Staad is much simpler and easier than in PDMS. It is also possible to transfer the modelled structure from Staad to PDMS, through the creation of an interface.

Review facilities

Review Reality and NavisWorks are amongst the favoured review utilities. These reviews can be conducted on individual basis or jointly. In joint reviews, personnel from various disciplines review the model in totality on a large screen with a view to have a realistic picture of the plant and identify the problems jointly (if any) at an early stage and find solutions amicable to all.

For nominal users of review, Aveva has come up with yet another review software called Review LE which has comparatively lesser features and is relatively less expensive.

Extraction of various documents

The following drawings can be extracted from the PDMS system:

- a) **Isometrics**
- b) **Equipment arrangement plan**
- c) **Piping GA**
- d) **Nozzle and clip orientation**
- e) **Concrete and structural GA, etc.**

PDMS can be utilised at various phases during the life cycle of the plant. The various stages apart from engineering are:

- a) **During construction**
- b) **During post construction phase**

Usage during construction

Engineering companies are known to deploy PDMS tools at site to issue site modified drawings to maintain the model in line with reality.

Usage post construction

Once the AS-Built PDMS model is furnished to the client as a deliverable, the same is further utilized by the clients for de-bottlenecking, expansions, etc.

Conclusion

Effective utilisation of the latest available software, in-house development and deployment of routines, applications and systems, backed by a desire to constantly improve on its systems, will undoubtedly enhance an organisation's reputation as a sound design and engineering company, ensuring quality, avoiding re-work and getting first-time-right results on time. Complementing these factors, is a judicious use of some 2D systems, where required, so that optimum results of design engineering are achieved and made available to the company's clients.

Editor's Note: Uhde India is a leading engineering consultancy company with vast experience in implementing Indian and international projects using the state-of-the-art design engineering tools described in the article. Many of developments elaborated herein have been successfully developed and put to use for the company's projects. The company also follows an intensive programme for training its engineering resources and fine-tuning its design tools.