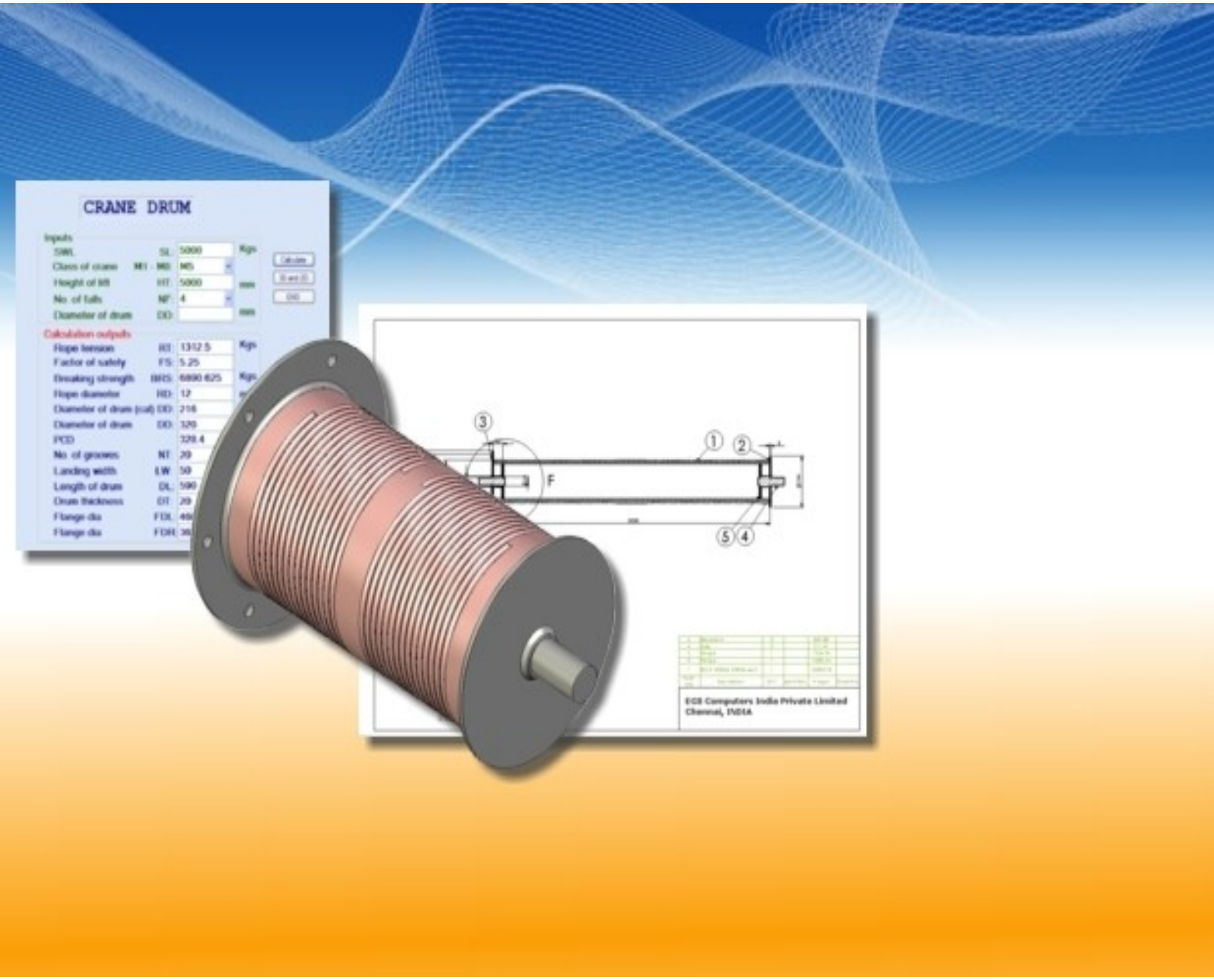
White Paper Series

Design & Drawing Automation using 3D CAD – Powerful, affordable and easy



Evolution thro' Knowledge

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Engineers have always had a passion for writing programs (since the advent of Fortran) that would perform calculations based on design parameters provided, to arrive at sizing dimensions. Be they calculations involving Heat Transfer, Fluid Flow, Strength or Deflection, engineering community has evolved many standards including TEMA, EJMA, ASME, API or Material Handling codes, for specific engineering requirements.

Going a step ahead, let us pose some questions for the benefit of organisations:

1. How to ensure that knowledge possessed by the Engineering Team is always available and put to effective re-use for Benefit of the company?
2. How can error-free drawings be produced there-by eliminating re-work and revisions while reducing time?
3. How to increase the productivity of a Designer, who generates Drawings, without compromising on accuracy?
4. Can lead time required to produce drawings, even at RFQ Stage, be reduced so that the product development cycle time can be compressed?

Effectively, the answers to these questions lead directly to the profitability, efficiency and IPR of the organisation. Essentially all of the above relate to design engineering functions, either directly or indirectly.

Rule Based Engineering Design:
Knowledge, when put to re-use, with automated decision making, results in higher productivity and reduced errors. Rule based engineering design created within a framework of knowledge driven design process helps in developing fool-proof designs of products that could have variants as well.

Benefits of this approach is manifold:

1. Knowledge available with various members, across different levels, in an organisation is given a form for effective re-use
2. Decisions made are logical and driven by finite set of parameters
3. Specification of a product design gets refined and well-defined
4. Range and limitations of the knowledge, ability to re-use and the Company's IPR gets documented

Modern day 3D CAD Systems, such as SolidWorks, have built-in/ add-on products functionalities that help capture knowledge based on rules defined by users as shown in Fig. 1. Part features and their dimensions are captured to create rules with facility for decision making.

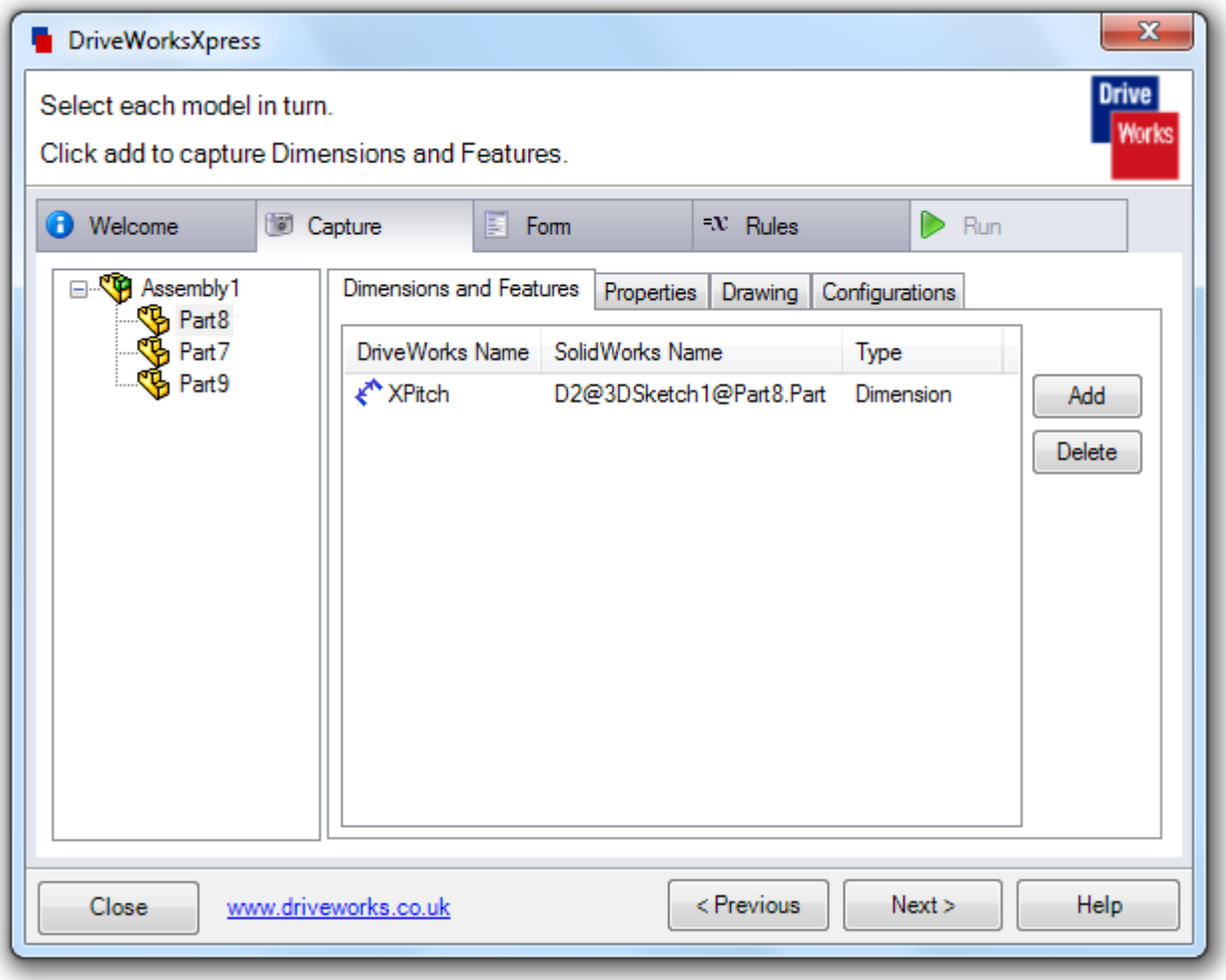


Fig. 1: DriveWorksXpress inside SolidWorks helps automate designs faster & easier

Additionally, spreadsheet calculations driven dimensional mapping enables design engineers to develop 3D models of their designs faster. Microsoft Excel driven Design Table, as shown in Fig.2 enhances the power of design engineers to embed their calculations to drive design dimensions.

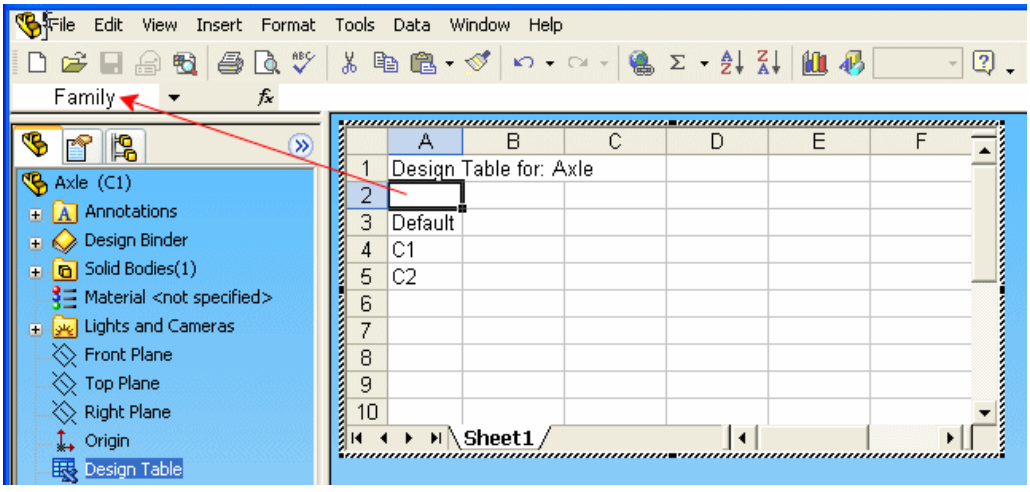


Fig. 2: Embedding Design Table inside SolidWorks with Microsoft Excel

In these approaches, not a single line of programming code needs to be written to develop designs ! Integrating such spreadsheet based calculations with configuration of parts/ assemblies (product variants) gives powerful alternatives to designers for automating designs.

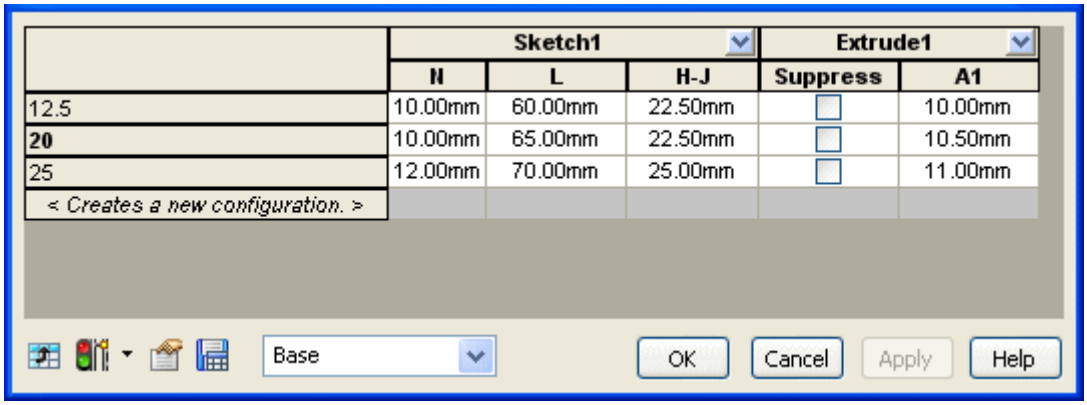


Fig. 3: SolidWorks Configuration manager exploiting Microsoft Excel for Family of Parts and Assemblies to create product variants

For example, the automobile brake rotor model shown in Fig. 4 facilitates design and drawing automation for a family of rotors at a fraction of the time required to produce the same manually. Configuration Manager ensures that the casting and machining drawings come out of one integrated design database, thereby reducing time, errors and increasing productivity.

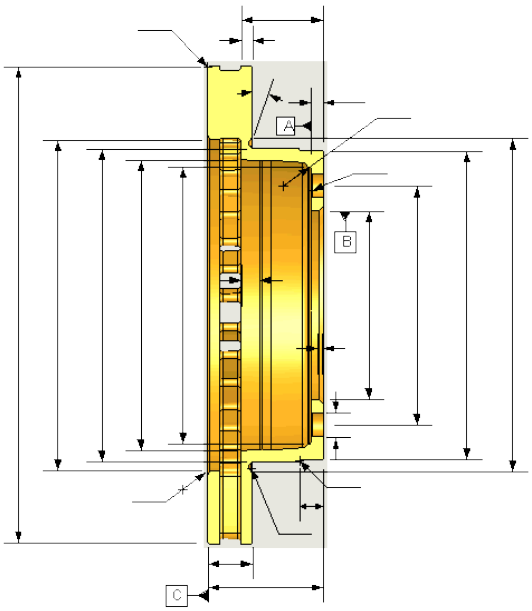
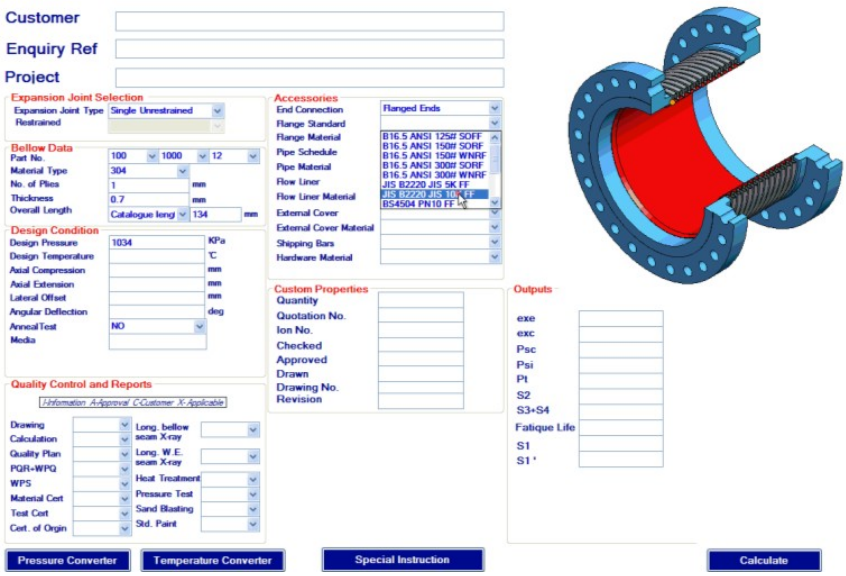


Fig. 4: Automating Designs and Drawings with Rule Based approach

Drawing Automation – Recipe for higher productivity



With design automation enabled, drawing generation is the next step that extends the benefits further. Visual Basic, .NET Framework and Macros (enabling VBA) are common programming approaches adopted by CAD Design Automation experts to create user-input forms (Fig. 5), manipulation of design data and update of template-based 3D CAD Geometries resulting in picture-perfect drawings (Fig. 6). Intrinsically the design knowledge, product representation, adherance to standards, if any, are automatically complied with, resulting in gains for the organisation.Fig. 5: Sample Input Form that drives 3D Design and associated 2D Drawing

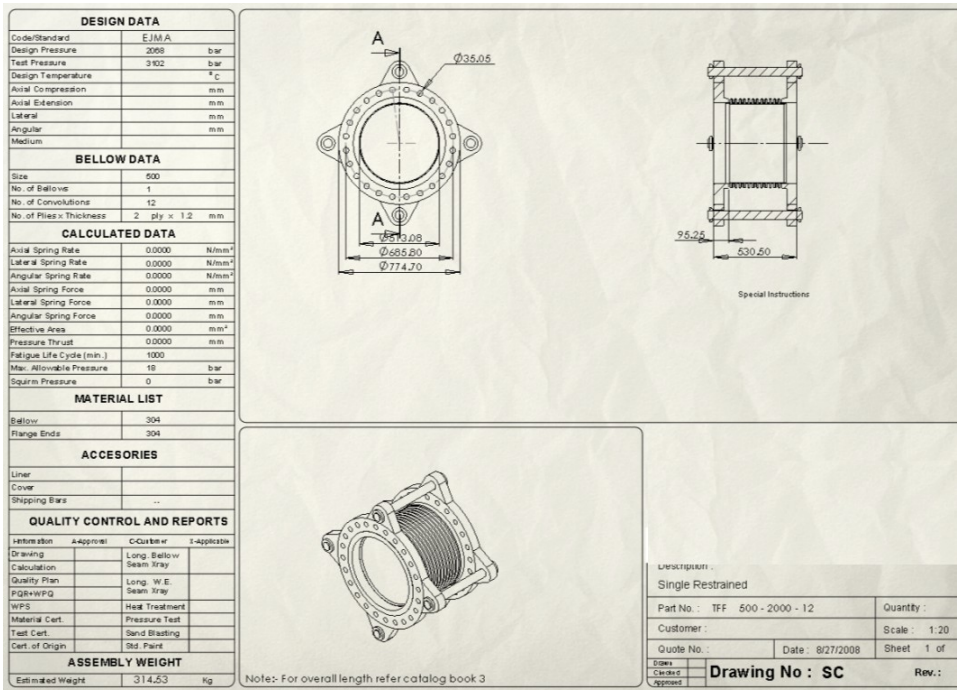


Fig. 6: Sample Drawing Output using SolidWorks API

With Open architecture and user-friendly programming approach offered by

mid-range 3D CAD software such as SolidWorks, high level Design and Drawing Automation is now within the reach of Engineering Organisation at a fraction of the cost of investment in 'high-end' CAD software of yore.

Summary:

Customers, for example, in the power sector, have derived huge benefits in time savings and cost savings by employing design automation, even at the RFQ Stage. Boiler assemblies, Pressure parts, pressure vessels, steel structural supports, plant engineering functions, material handling equipment design are some of the areas that have already witnessed rapid deployment of design automation as a framework for reducing development cycle time.

Imagine a Crane manufacturer getting the customer requirement via Web, and then triggering the automation process of assembling the crane in 3D, developing the General Arrange Drawing of the assembly and individual part drawings of required components, exporting the Bill of Materials for cost estimation and providing a proposal to the customer in a few minutes! Add to that, the manufacturing process drawing automation, running weld length estimation and stage wise drawings provided to the manufacturing team, once the order is obtained, and we have a winning combination of higher productivity, error-free process and above all capturing all essential data available across the organisation for better re-use.

3D CAD has matured with high levels of technology integration, enabling engineering corporations to adopt a risk free approach to product development in the fastest manner possible. Only the challenges of assimilating the knowledge and securing the same remain. 3D CAD Design and Drawing Automation has come of age for large-scale adoption for higher productivity. It comes with no strings attached !

About EGS India:

EGS Computers India Private Limited, since 1993, has been providing Design Engineering Services for customers world-wide. 3D CAD Customization Services, Design and Drawing automation services using SolidWorks 3D CAD has been provided by EGS India to customers in varied segments of applications, including Automotive, Material Handling, Power, Process, Foundry and Sheet-Metal Stamping Industries.

EGS India is the Authorised Reseller for SolidWorks CAD Software, DriveWorks Automation Framework, SigmundWorks Tolerance Stack Up Analysis Software, ElecWorks for Electrical Mechanical Design Integration, Camnetics Suite of

Gear and CAM modelling products to customers in India.

ACADEMIX, training division of EGS India, provides Real-World practical training on the use of SolidWorks, FEA, G D & T, and Tolerance Stack Up Analysis.

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