

# INTERGRAPH® CADWORX® & ANALYSIS SOLUTIONS



**PLANT DESIGN AT YOUR  
FINGERTIP**

**INTERGRAPH®**

# INTRODUCTION

The use of intelligent plant design tools is an obvious choice for most medium- and large-sized engineering companies today. The business benefits are so significant that it is not an option to do plant design without them: designs are created faster, with better quality and increased safety standards.

Intergraph has been a major player in this niche market for decades, with its PDS® and SmartPlant® solutions, servicing the larger EPCs and Owner Operators players worldwide, providing state-of-the-art high tech solutions for execution of medium- to large- and mega-sized capital projects.

Recently Intergraph also became interested in the segment of smaller and less complex projects by acquiring the AutoCAD-based CADWorx solution.

With this solution, Intergraph wants to serve a whole different group of the plant design world: Engineering companies executing smaller projects such as “revamps”, “turnarounds” and “extensions” of existing plants – the so-called “Brownfield” projects, as well as Owner Operators executing small maintenance-related projects, and companies that build package units, skid-mounted installations or equipment builders, for example vessels, pumps, or compressors.

The biggest differentiator between the execution of small projects and large capital projects is there is usually little time and no budget for training, administration and maintenance costs. These are significant factors when choosing and using enterprise plant design software.

**This is where CADWorx comes in!**

## SIZE DOES MATTER

**Big projects from small budgets**



# TIME DOES MATTER

Short learning curve and quick startup

*“We saved time in extracting materials and making bills of material, in a way that we could do in half a day what normally takes a week.”*

Maaïke Mertens, Lead Designer at Temco

## INTERGRAPH CADWORX

CADWorx Plant Professional is an AutoCAD-based plant design system, extremely productive and easy to use and implement. Actually, plant design doesn't get any easier than this! It is designed in modules, including:

<b>PLANT</b>	Offering 3D modelling capabilities of Piping, Structural, Equipment, and Ducting (e.g., cable trays and HVAC)
<b>DESIGN REVIEW</b>	Offering quick 3D viewing capabilities without requiring AutoCAD for walkthroughs
<b>ISOGEN®</b>	To generate isometric construction drawings of pipes
<b>P&amp;ID</b>	To create P&IDs, PFDs, and associated lists and forms
<b>INTERNET PUBLISHER</b>	To share the CADWorx P&IDs over the Internet or Intranet

### CADWorx is scalable

It can either be used without a database or with simple databases like MS-Access, MS-SQL, and Oracle database engine.

### CADWorx is easy

The setup usually takes less than an hour if a user has basic AutoCAD and plant design engineering knowledge. A person can be trained in only five days to be capable of using the whole suite, including P&ID, 3D, Navigator, Isogen, and Internet Publisher.

### CADWorx is integrated

CADWorx Plant 3D is integrated with P&ID, making sure the 2D P&ID design is validated within the 3D model and preventing expensive design errors. A relevant differentiator of CADWorx compared to its competitors, is the interface between CAD and CAE. CADWorx Plant is integrated with Intergraph's **CAESAR II®** - Pipe Stress Analysis, and **PV Elite™** - Analysis and Design of pressure vessels and heat exchangers.

CADWorx can also be used in combination with **Intergraph SmartPlant®** products:

<b>SmartPlant Instrumentation</b>	To import the instrument index from P&ID for further instrument design
<b>SmartPlant Electrical</b>	To import the electrical consumer list from P&ID for the design of the electrical distribution network
<b>SmartPlant Review</b>	For large combined 3D models of different resources
<b>SmartPlant Reference Data</b>	For pipe specification management
<b>SmartPlant Materials</b>	To manage the bill of materials, the ordering process, and the materials on the construction site
<b>SmartPlant Isometrics</b>	To create more detailed Isometrics and round tripping – from 3D to 2D to 3D
<b>SmartPlant Spoolgen</b>	To automatically generate isometric spool pieces ready for construction while keeping track of the material and welding traceability and the planning and status of the construction

Engineering companies working as sub-contractors in large capital projects that use Smart 3D tools can convert CADWorx models into Smart3D reference files. The CADWorx model can be incorporated within the Smart3D model in such a way that all objects are visible, and it is also possible to query the CADWorx objects and visualize all their properties. The clash-check will recognize the objects and generate combined drawings.

### CADWorx is the future

CADWorx 2013 is our latest release and comes with a powerful new pipe routing engine. Pipe routing has never been so easy! Please follow this link for more information about all CADWorx features: [www.intergraph.com/global/eu/go/cadworx](http://www.intergraph.com/global/eu/go/cadworx)

**All these ingredients make CADWorx the ideal solution in the execution of smaller and less complex projects.**


# PERFORMANCE DOES MATTER

Intelligent workflow, improved productivity, and fast turnaround

*“The benefits of the Intergraph CADWorx & Analysis Solutions integrated approach, which we had not seen before, surprised everybody. No one had imagined how project tasks could be simplified so optimally.”*

Kunal Patel, CAD Designer at JFMPE Inc.





*“We were able to build accurate designs and assemble and model all equipment details, including support equipment, steelworks, accessory device, and piping. We enhanced stress analysis efficiency and accuracy by more than 50 percent.”*

Gu Quanbin, Project Engineer at Wuxi Huang Boiler Company Ltd.

Benefit from the bi-directional link to analysis  
**SAFETY DOES MATTER**

## **ANALYSIS TOOLS: CAESAR II AND PV ELITE**

### **CAESAR II - Pipe Stress Analysis**

Intergraph CAESAR II evaluates the structural responses and stresses of piping systems to international codes and standards. After the 3D pipe routing has been completed, it can be exported to CAESAR II for Pipe Stress Analysis. The pipe class information, such as material and pressure, is retained. CAESAR II determines whether the piping design is working and is compliant with the relevant piping codes. This increases productivity through the reduction of errors and saves time from release to approval. CAESAR II also has the capability to analyse piping systems in accordance with more than 30 International Piping Codes.

CAESAR II is well known in the world of Pipe Stress Analysis and enjoys a healthy market share of an estimated 75 percent.

In addition to the evaluation of a piping system's response to thermal, deadweight, and pressure loads, CAESAR II analyses the effects of wind, support settlement, seismic loads, and wave loads. Nonlinear effects such as support lift off, gap closure, and friction are also included. CAESAR II can select the proper springs for supporting systems with large vertical deflections. Dynamic Analysis capabilities include modal, harmonic, response spectrum, and time history analysis.

### **PV Elite – Analysis and Design of Pressure Vessels and Heat Exchangers**

The same type of interface applies for the design of pressure vessels and heat exchangers. The modeling of the equipment starts in CADWorx Plant. The design can then be exported to PV Elite for analysis. Any design changes required after the analysis of the equipment can be directly incorporated in the CADWorx 3D model.

PV Elite also enjoys an excellent market share as a leading product within the industry, being used by operators, leading EPCs, contractors, notified bodies and many others. PV Elite analyses pressure vessels in accordance with four international design codes. Main benefits include: Exchanger design and analysis, Tube sheet design and analysis, Cylindrical and Rectangular vessel analysis. PV Elite performs calculations in accordance with ASME Section VIII Divisions 1 & 2, PD 5500 and EN 13445. Rules from API 579 (Fitness for Service) are also included for evaluating the current state and remaining life of existing vessels.



## BROWNFIELD PROJECTS

Ninety percent of all EPC projects are projects in existing plants – from the smallest maintenance-related project to revamps, turnarounds and extensions. Most of these “Brownfield” projects are below 10 Million euros.

For these types of projects, an image of the as-built model of the plant will be needed. This can be a previously created 3D model that Intergraph will be able to convert to CADWorx as a service.

### CADWorx FieldPipe

Alternatively, CADWorx FieldPipe can create an image of the plant by using laser-scanning or laser-tracking technology.

#### Laser-Scanning Functionality

Here an accurate as-built model of the plant is created with a laser scanner in the form of a 3D image called a Point Cloud.

Several scans from different locations are required to gain a complete image of the plant. After the laser-scanning process has taken place in the field, the different point clouds will be merged into one.

#### Laser-Tracking Functionality

In this case a laser-pointing device is used to measure different points on a pipe to make the routing. The laser-tracking equipment is significantly cheaper than the equipment for laser-scanning – a Leica Total Station starts at around 5.000 euros.

Laser-tracking equipment is only suitable to measure pipe by pipe, but on the other hand, the accuracy is higher than in point clouds. This makes it an ideal solution for smaller projects. Another benefit is that you can directly use the 3D routing information of the pipe with CADWorx FieldPipe and create an intelligent model in the field, including the bill of materials, isometrics and if needed, even a stress analysis of the pipe.

Both methods prevent companies from carrying out inaccurate measurements with tools like spirit levels, measuring tapes, and step ladders.

**CADWorx Fieldpipe will improve your efficiency, quality and safety.**

## ADDED VALUE OF CADWORX DURING MAINTENANCE AND OPERATIONS

Owners are primarily focused on their core business and the majority of them do not have an engineering department.

The large numbers of AutoCAD and Microstation drawings are a result of different companies and people changing the drawings over the years. Sometimes without good standards and work procedures in place that would ensure correct and safe information.

Only a few owners keep the 3D data of their original plant current. Historically, this was understandable because keeping a 3D model alive for small projects, maintenance, and operations was very expensive. The software was costly to maintain and so were the people to keep a 3D model current. This is not the case anymore.

**A small investment for an easy and accurate 3D model!**

# BUSINESS BENEFITS

So, what are the most important business drivers of the owner and where can the implementation of CAD and CAE solutions help them to achieve this?

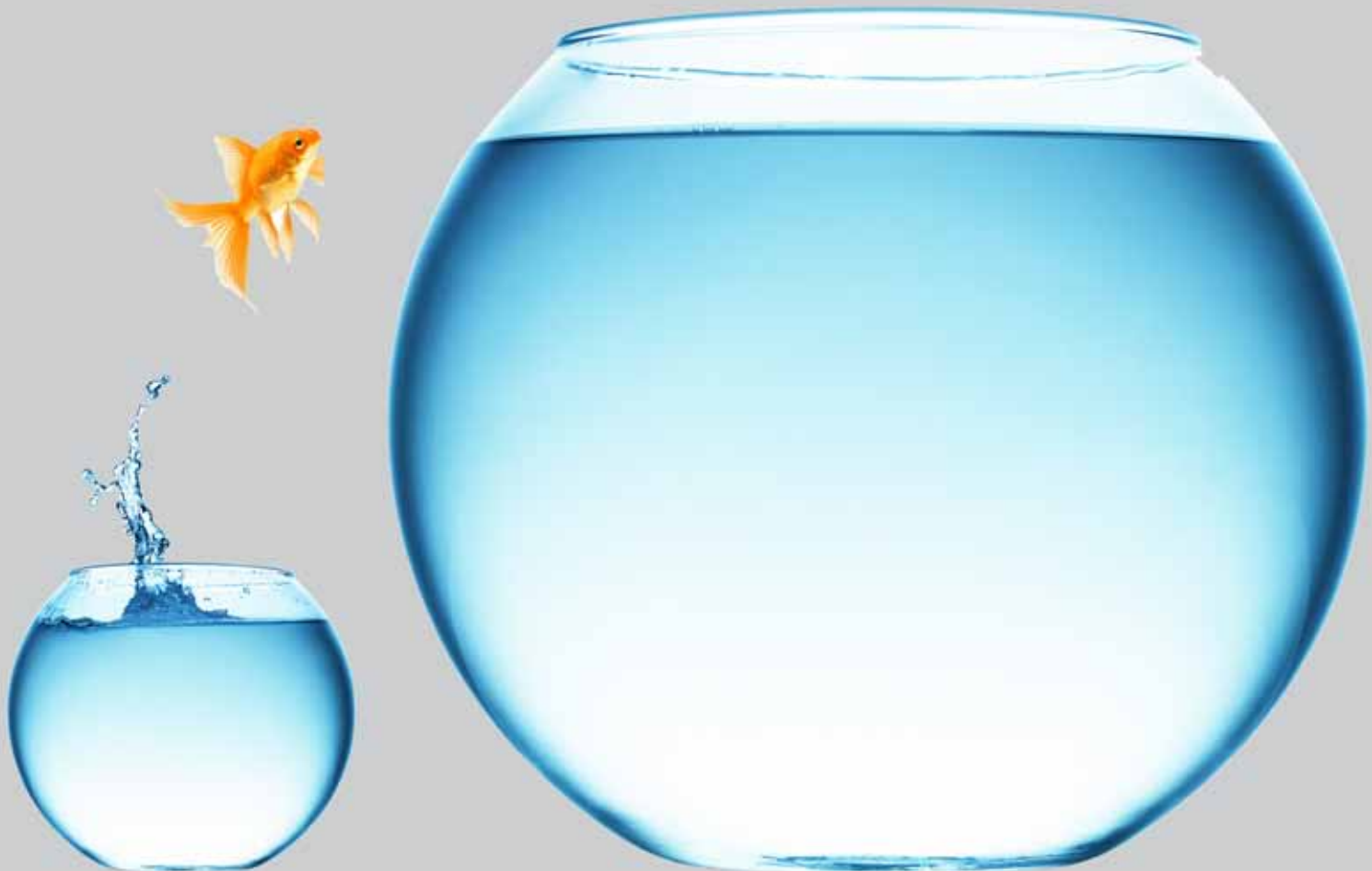
- **Time to market** - By keeping the plant running as long as possible, producing as much as possible.
- **Cost saving** - During maintenance, operations, and in projects.
- **Quality** - By getting better quality with less investment.

Intergraph CADWorx and Analysis products focus on improvement of all three business drivers while complying with government regulations of health, safety, and environment.

**Benefit from better quality of your engineering information, save on design and engineering costs and shorten the maintenance repair cycle and the duration of brownfield project execution to achieve an earlier plant start-up!**

## FUTURE DOES MATTER

The scalable solution that grows with you



# INTERGRAPH CADWORX 2013: PLANT DESIGN WON'T GET ANY EASIER THAN THIS!



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