

eXperience **No 02**

Plant Industry



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Leveraging mobile, cloud and AR/VR technologies

In this edition of the Plant eXperience magazine, we highlight our customers' experiences of CADMATIC software and present some eye-catching software developments: FollowApp to monitor 3D project progress on mobile phones and eShare for Microsoft HoloLens, an exciting addition to our Information Management product family.

We have had a truly excellent year. We managed to increase revenue by 29%, which boosted our turnover to over €20 million euros. Over a two-year period, we have increased the number of CADMATIC user organizations by 20%. Our software is now used by over 1000 user organizations in 58 countries.

Close cooperation with our customers is a key aspect that has allowed us to grow our business. When our customers are successful, we are successful!

We focus on ease of use and solutions that allow our customers to gain efficiencies in data-driven design and plant information management. Our customers report that our technologies for online and globally distributed design are very competitive. It also ensures high quality when the best and most cost-efficient resources can be used in the same projects.

In this edition, we have two articles about engineering companies that have reported significant efficiency gains after implementing CADMATIC. Pannon Engineering from Hungary, is making a name for itself in the oil & gas sector. They report that CADMATIC has

improved consultations with their customers and assisted them to work faster and more accurately. Process Service from Italy, is focused on the design of chemical and pharmaceutical plants. They have highlighted the flexibility of CADMATIC, which allows them to customize all parts of their design models as well as the high level of integration with other disciplines.

We also have an article about Smurfit Kappa Piteå, the largest kraftliner producer in Europe, with a focus on their use of laser-scanning materials, which they import into CADMATIC models to guide design and development. The use of laser-scanned information in their design projects has sped up their design process.

2018 a breakthrough year for information management solutions

Many customers are showing an interest in our eShare information management solution. For example, Saudi Aramco and ENI, two of the biggest oil and gas companies in the world, have started using our solution worldwide to build their

digital twin solutions and to manage their digital design, construction and operational data better.

Our continued efforts to digitalize engineering, construction and operational processes can be seen in modern applications, including the latest AR/VR technology integrations we have developed.

On page 20, we have an article that follows the application of AR technologies for design review with Microsoft HoloLens. It offers an entirely new and exciting interactive design and engineering experience in augmented reality where digital 3D models reside in the real-world environment.

We also have an article about the CADMATIC FollowApp for mobile project monitoring. The app is currently free of charge, so I urge our customers to download it and to start experiencing the convenience of tracking key CADMATIC design project metrics on their mobile phones.

I wish you all happy reading and welcome your feedback.

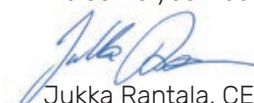

Jukka Rantala, CEO



Photo © Timo Mäkipää



Smurfit Kappa Piteå

Gaining efficiencies with laser scanning technology

Smurfit Kappa Piteå in the north of Sweden is the largest producer of kraftliner in Europe, with an annual output of 700,000 tons of base paper used in the manufacturing of high quality corrugated packaging. In order to bring efficiencies to its plant design and modification projects, the company has invested in a laser scanner and CADMATIC's laser scan modeller.

With the help of these tools, Smurfit Kappa Piteå avoids the need for manual measuring at the plant during projects and provides engineering suppliers with more exact and better quality information to be used as the basis of design work.

Smurfit Kappa Piteå's business relationship with CADMATIC stretches back to 2000, when it purchased eBrowser licenses to review plant models designed with CADMATIC software by consultants. Today, the company hosts its own CADMATIC model and database that covers parts of the plant. Some of the subcontractors also use the CADMATIC CoDesigner to distribute projects and master replicas.

Saving time with laser scanning

Smurfit Kappa Piteå's latest addition to the CADMATIC software ecosystem, the CADMATIC Laser Scan Modeller, was implemented in 2017. It is used in conjunction with a FARO Focus 3D laser scanner, which the company purchased for use by its own staff and those of its engineering subcontractors.

The point clouds produced with the laser scanner can be imported into CADMATIC 3D models to act as a guide when modifications are required. According to Peder Ögren, Project Department Manager at Smurfit Kappa Piteå, the laser scanner and the supporting CADMATIC software have completely changed their way of

More about Smurfit Kappa Piteå

Smurfit Kappa Piteå is Europe's biggest producer of kraftliner with an annual output of 700,000 tons. The company was founded in 1962 and is part of the Smurfit Kappa Group (SKG). SKG is one of the leading providers of paper-based packaging solutions in the world, with around 45,000 employees in approximately 350 production sites across 33 countries. Construction of the kraftliner mill in Piteå was completed in 1962. Initially, its production capacity was 100,000 tons but investments over the years in more machinery has seen the capacity reach to 700,000 tons annually. In Piteå, the company is the largest employer in the private sector.



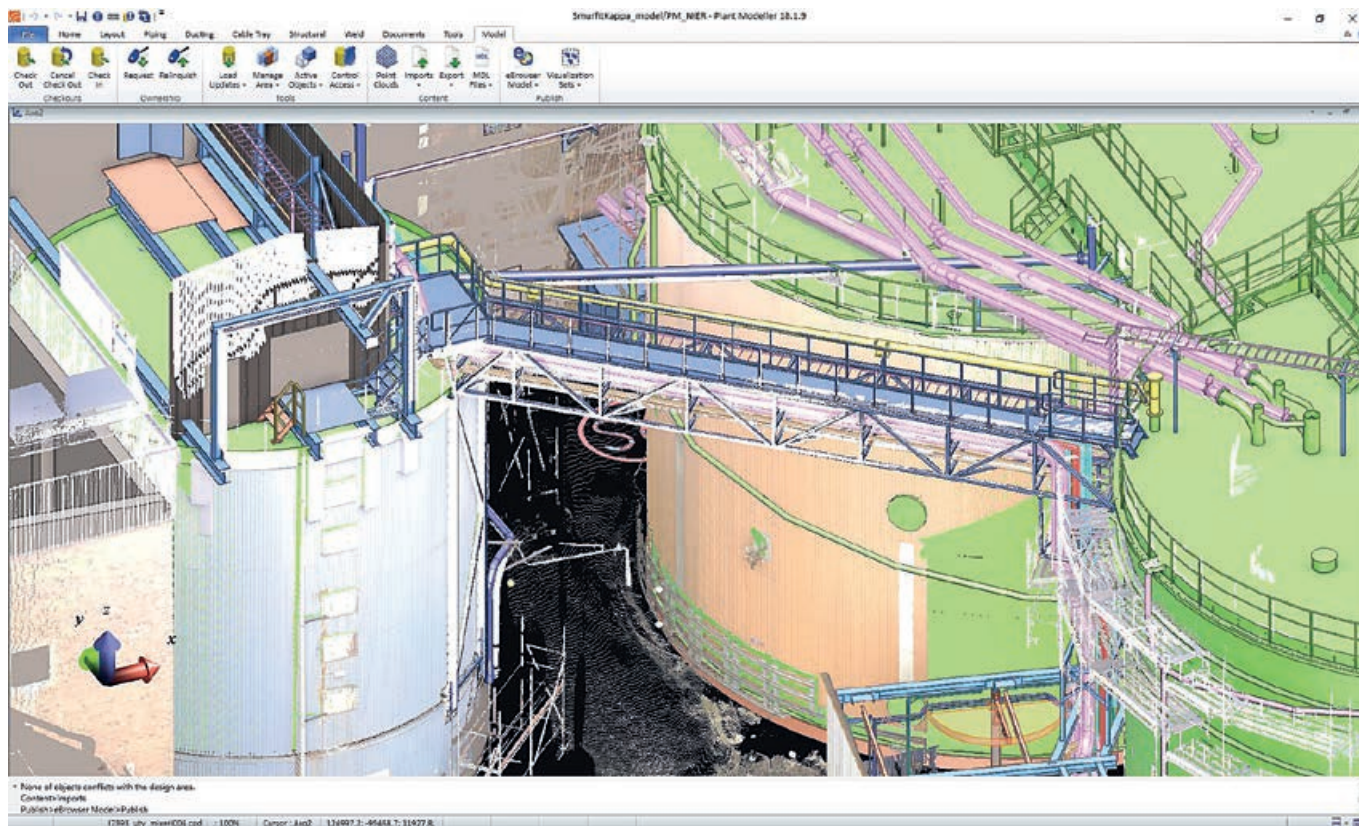
Photo © Caroline Lundmark

working, especially in revamps and modification projects.

"We want to avoid losing valuable time in projects with designers running around the plant taking manual measurements. It is not only time consuming, but humans can make errors, while the laser scanner produces measurements that are accurate up to the nearest millimetre. In the worst-case scenario, a human error can lead to

operational downtime. Now the accurate laser-scanned information can be imported and used on design projects, which speeds up the entire design process. Any modifications to the design can immediately and reliably be verified in the 3D model for its feasibility. It practically eliminates the need to make any assumptions or do guesswork," says Ögren.

The Piteå paper warehouse from where all reels are transported to customers.



The laser-scanned point clouds are imported into the CADMATIC 3D model and used to guide designers when making modifications.

More about Laser Scan Modeller

The CADMATIC Laser Scan Modeller is an integrated solution for seamless use of data from laser scanners to 3D models and construction data. It boosts the use of laser scanning technologies in design projects.

- Compatible with most often used laser scanning equipment or point cloud formats.
- Point clouds can be utilized directly in CADMATIC during design using familiar tools.
- Easily view and examine existing layouts when sketching new layouts.
- Directly use your settings, library and components in CADMATIC for correct attributes and materials.
- Check designs during construction to correct errors made in earlier stages.
- Reduce time significantly for surveys, operational down time and the need of onsite visits.
- Quickly estimate scope of changes.
- Active / inactive filters to boost performance.
- Reduce the number of unknowns and assumptions regarding existing constructions, significantly decreases rework due to the instant availability of accurate dimensions of spatial geometries.
- Simply load binary files into the full version of eBrowser to review your project.

Subcontractors making use of laser scanner

The FARO laser scanner is also used by some of Smurfit Kappa Piteå's engineering subcontractors.

"It makes sense for our subcontractors to make use of the laser scanner. This way they can scan precisely those areas they need to work on and import the point clouds for use in the design projects. This also eases the workload on our side so it's a win-win situation," Ögren continues.

eBrowser used to follow design process

Smurfit Kappa Piteå follows the design process and reviews designs created by its subcontractors with CADMATIC eBrowser.

"Accurate laser-scanned information can be imported and used on design projects, which speeds up the entire design process."

"Our subcontractors publish eBrowser models when the need arises. It's a very easy and efficient way to check the status and make comments on the design as you can see the existing model with the point clouds and current designs all in one place," says Ögren.

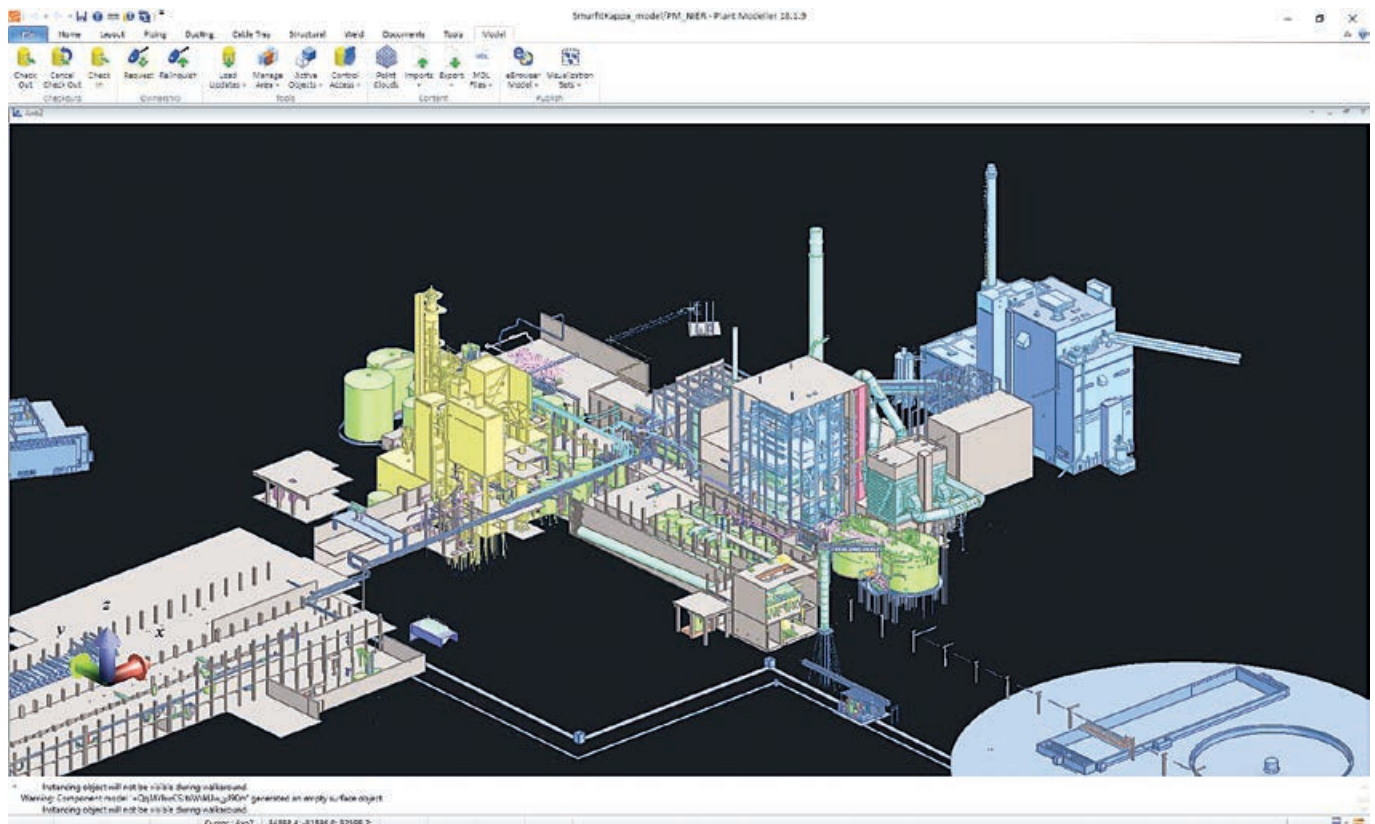
A growing number of CADMATIC Plant Design companies are showing an interest in laser scanning technologies and the CADMATIC

Laser Scan Modeller. Smurfit Kappa Piteå is a good example of how these technologies can be implemented beneficially.

"We are very proud of our association with Smurfit Kappa Piteå and the good working relationship we have built up with them over the years. It is our goal to be associated with the top companies in their respective fields. I am also happy that Smurfit Kappa Piteå has implemented our Laser Scan Modeller successfully and that they are reporting efficiency gains," says Jim Nyroos, Senior Sales Manager at CADMATIC.



A 3D model of the Piteå plant.





Photos © Henri Särkkä

CADMATIC Users' Meeting an outstanding success

The CADMATIC Users' Meeting 2018 held at the Joki Visitor and Innovation Centre in Turku, Finland from 12-13 September was an outstanding success. Close to 250 participants from 24 countries took part in the two-day event. The event included a get-together party, presentations by both CADMATIC staff and partner organizations, as well as workshops and a gala dinner.

The biennial CADMATIC Users' Meeting is an ideal event to meet and network with other CADMATIC software users, get first-hand experiences of the latest software features and to influence and gain insights into future developments.

The benefits of using new digital applications in design and construction projects was of particular interest at this year's event, as well as completely new software interfaces and use cases such as virtual reality and augmented reality. Information Management was another

important theme that drew much attention.

The event also saw the unveiling of the CADMATIC FollowApp. The app allows stakeholders of CADMATIC design projects to view various project metrics conveniently from their mobile phones. These metrics include e.g. the total length of pipes, total mass of pipes and pipefittings and the number of pipelines. The metrics are automatically uploaded to FollowApp at scheduled times from CADMATIC Plant or CADMATIC Outfitting projects. See more about FollowApp on page 14.

Participants also had an opportunity to experience the integration that has been created between Microsoft HoloLens and CADMATIC eShare. The Microsoft HoloLens headset can be used to view the CADMATIC 3D model. See more on page 20.

In addition to informative presentations, workshops, and meetings with Product Owners, event participants also took part in a festive gala dinner held at the Kankainen Manor near Turku.



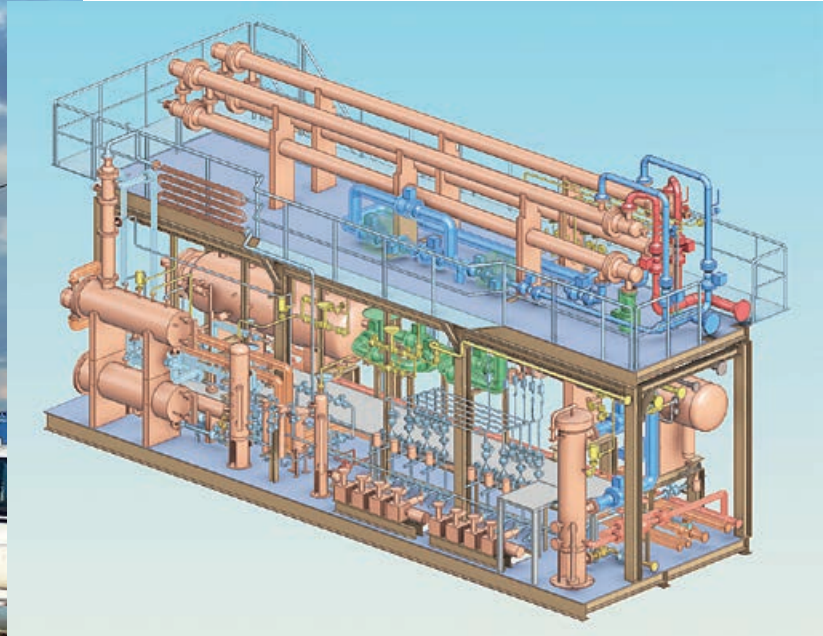
Pannon Engineering

Compact, but hard-hitting

Pannon Engineering Ltd is a compact, but hard-hitting engineering company from Hungary. It is located on the western border of the country, in the cradle of the

Hungarian oil industry. Since implementing CADMATIC software in 2011, the company has reported efficiency gains and higher accuracy in its oil and gas engineering projects.

The Konyár gas storage and gas handling station designed by Pannon Engineering.



Pannon Engineering Ltd. was founded in 1999 by former employees of MOL Nyrt, a Hungarian multinational oil and gas company headquartered in Budapest, Hungary. Pannon Engineering provides technological engineering, control engineering, and electricity supply design for the oil and gas sector.

The Pannon Engineering founders have a history in CAD design predating the founding of the company.

"Before we started our company, we were already familiar with CAD methods, even though only 2D at the time. At Pannon Engineering, we saw a growing demand from our customers for improved design standards, which in practice meant that there was an increasing need for 3D design," says Mr. Zsolt Hadri at Pannon Engineering.

Testing 3D design packages

Due to the growing demand for 3D design, Pannon Engineering

started testing various 3D design packages from 2010. The company's main requirements were a well-organized and soundly built database that could speed up their engineering work. In 2011, they selected CADMATIC as their preferred design tool.

"CADMATIC helps us to work faster and more accurately."



The Dew Control Module at the Oiltech Kft site before transportation.

"CADMATIC lived up our expectations already in the first year. Its structure and database met our requirements, which opened the way to real 3D design. We use CADMATIC for the design of modular skid-units and bigger plants. Compared to our previous software, CADMATIC helps us to work faster and more accurately. Any required rework and several variations can be done rapidly," Mr. Hadri explains.

Pannon Engineering has used CADMATIC to design several

smaller oil and gas industrial plants as well as their subassemblies.

"We use CADMATIC to design units like separators, heat-exchangers, manifolds, and heater skid units, but of course also for proper oil and gas plants like oil receiver and operation plants."

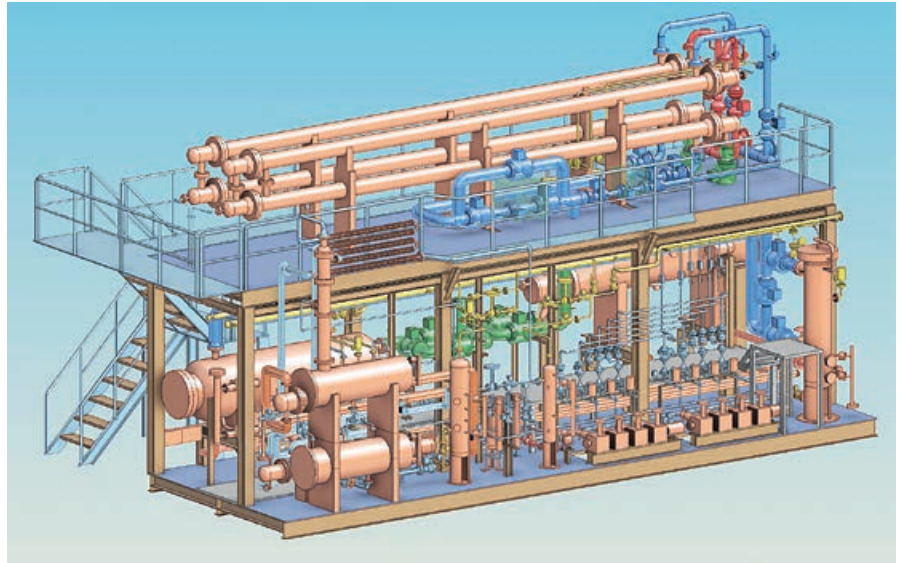
Gas storage and gas handling station

The Konyár gas storage and gas handling station in northeastern Hungary is one of the plants

that Pannon Engineering has designed recently with CADMATIC. The project was completed in 2018. The designed module sets the CH and water dew point of the handled gas to satisfy pipeline requirements.

The novelty in the design can be seen principally in how it contrasts with traditional horizontal arrangements. Pannon Engineering created a vertical arrangement for the design, which is the most suitable for the technology and

3D model of gas storage and gas handling station.



Mr. Zsolt Hadri, CEO at Pannon Engineering is happy with the efficiency gains CADMATIC has delivered at this company.



space requirements. Another important aspect was the compact implementation of the module. The module was implemented by Oiltech Ltd. See pictures.

Interactive consultations with customer

"CADMATIC was a great help during the interactive consultations with the customer on the Konyár project. It was fantastic to show the customer the ready technological unit on the screen, which

made the experience more realistic. The engineering work was also more interactive and trackable between the contracting party and our company. We could send the 3D model to the contractor during the design phase, which helped us to reduce collisions," says Mr. Hadri.

When asked about CADMATIC's most useful features, Mr. Hadri indicates *"the best part of CADMATIC is the grandiose 3D environment as well as the very efficient isometric production and arrangement*

drawing production. The database can be expanded very quickly and simply and the material take offs are also rapidly created".



CADMATIC FollowApp for mobile project monitoring

CADMATIC's recently launched FollowApp mobile application resulted from the development drive to maximize the utilization of mobile and cloud applications with CADMATIC solutions.

The application, which is currently available free of charge, allows users to monitor key CADMATIC design project metrics conveniently from their mobile devices. It reduces the uncertainty around project schedule and cost estimations in new projects. The data can be compared to other similar data from previous projects, which provides the user with a good understanding of the status of the project.

The app is available from both Google Play and Apple Store.

The project metrics that can be monitored with FollowApp include, for example, project 3D model progress by the total length, mass and number of pipes and pipe fittings, pipelines, pieces of equipment, cables, cable trays and ducts. The progress of P&ID can also be monitored during process

design as well as document production. The metrics are automatically uploaded to the app at scheduled times from CADMATIC design applications.

Storage in cloud service

The metrics are stored in a cloud service provided by CADMATIC. Actual design data is not published and access to the service is restricted to only authenticated users controlled by system administrators.

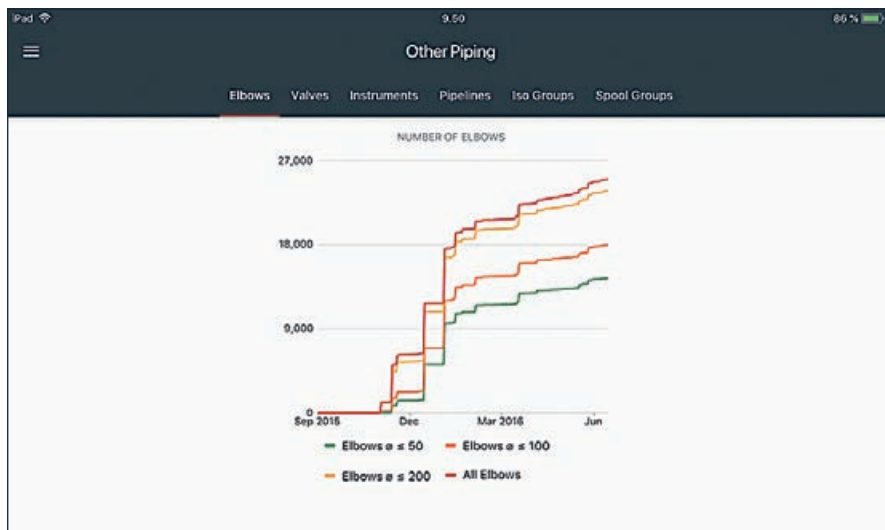
CADMATIC FollowApp in brief:

- Takes your business decisions to a new level – accurate and up-to-date project progress with an app for your mobile
- In-app reports provide visibility to key project metrics regardless of your physical location.
- Easy to compare project progress with targeted levels
- The metrics are stored in a cloud service provided by CADMATIC.
- Automatic, scheduled publishing.
- Demo data allows trying the app without having CADMATIC projects or licenses.
- Using the app is currently free of charge.

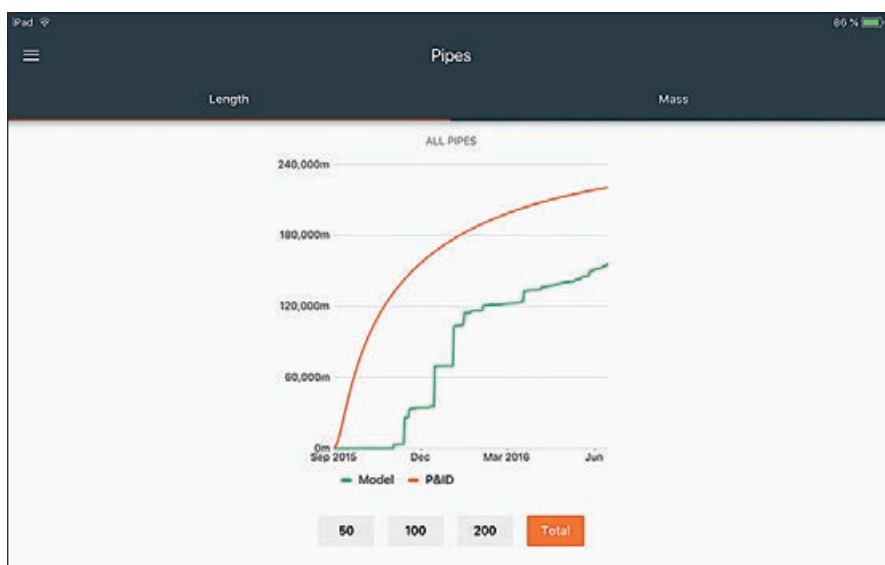


The app enables users to monitor project progress with the flexibility to adjust the periods and metrics covered. The app is available from both Google Play and Apple Store.

"We are very excited about what FollowApp offers our clients. Project Managers are becoming increasingly mobile and they need information at their fingertips regardless of their location. The FollowApp provides our software users with this kind of information wherever they are and allows them to react quickly, if necessary," says Sami Koponen, Vice President - Plant segment at CADMATIC.



Monitoring the progress of the number of elbows in a design project with FollowApp.

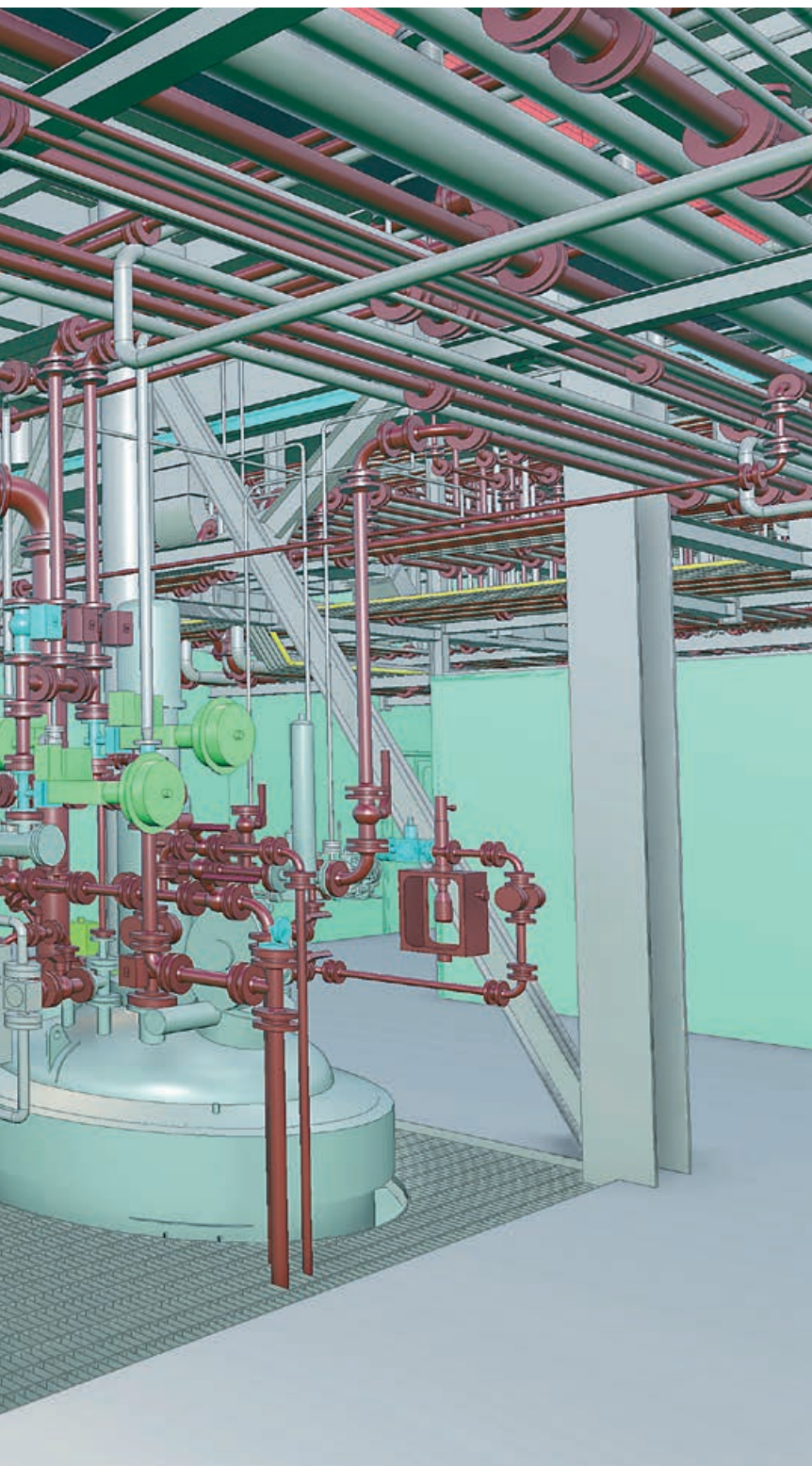


Monitoring the length of pipes and P&IDs in a design project with FollowApp.

Process Service

Pharmaceutical plant excellence





Process Service is an Italian engineering company focused on the design of chemical and pharmaceutical plants. Since late 2017, the Milan-based company has used CADMATIC successfully for demanding pharmaceutical plant design. The company is particularly satisfied with CADMATIC's integration with other software packages and the ease with which models can be shared and modified.

According to Process Service Managing Director Alessandro Pietra, the company started using CADMATIC in late 2017 for the piping design of a new project. Prior to implementing CADMATIC, the company had been searching for a 3D design software that was suitable for modelling pharmaceutical plants.

"We took a calculated risk by using CADMATIC at the time as the software was unknown to us and the project we implemented it on was very important. Looking back, it was a risk well worth taking," says Alessandro.

Integrating different disciplines in pharmaceutical plant design

In pharmaceutical projects, the integration of different disciplines such as piping, cable routing, air conditioning, instruments and electrical plants, structural elements

and pharma walls are particularly important. It is also crucial that the plant model can be easily modified according to client requests.

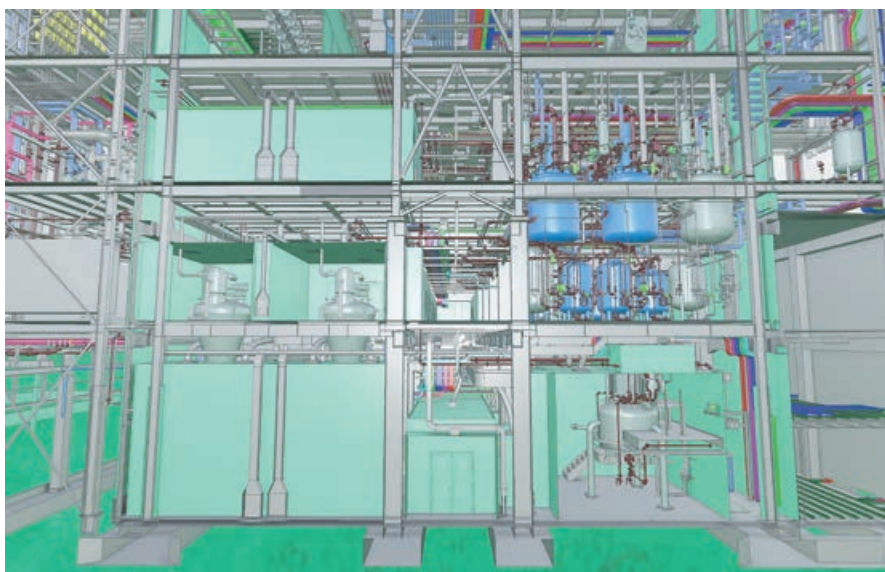
"With CADMATIC you can customize every part of the model and it also allows a great amount of integration with other disciplines."

"CADMATIC meets these requirements perfectly. In addition, we also use eBrower to share the model during plant development, which is a winning strategy in pharmaceutical plant projects. We share the reader-only and very light files with our clients on a weekly basis to present technical solutions and how our work is progressing. Clients often change their opinions regarding technical solutions, usually when pipes and ducts are already designed. The ability to see the plant in 3D before

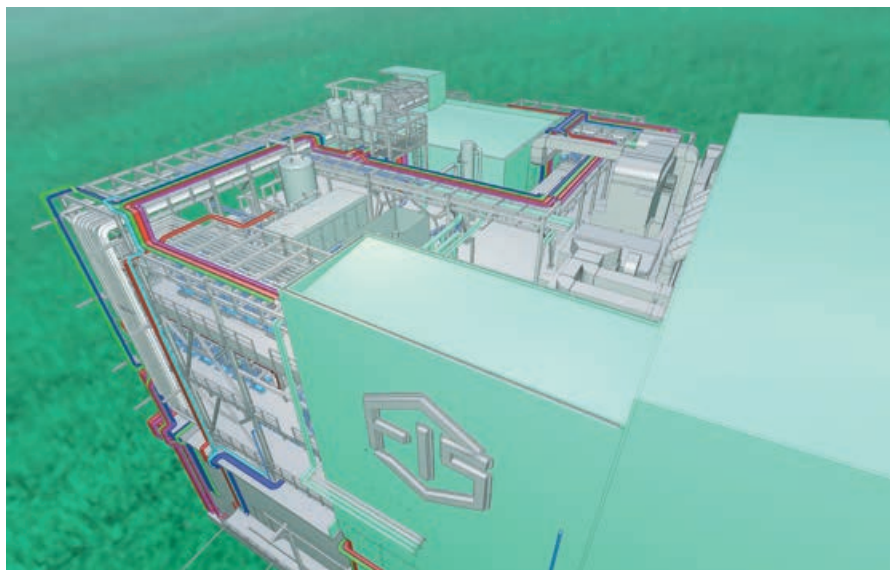
construction reduces the amount of rework a lot," says Alessandro.

He points out that pharmaceutical plants require many "special parts" that are not available in standard libraries. In this respect, he is also satisfied with CADMATIC's ability to model and insert customized equipment with appropriate connections.

"With CADMATIC you can customize every part of the model and it also allows a great amount of integration with other disciplines. At Process Service, we often use the



3D model images of an active pharmaceutical ingredient plant designed by Process Service for Fabbrica Italiana Sintetici SpA.



expression “CADMATIC eats everything”. The possibility to insert part of a plant developed by other technical departments, for example, civil and structural engineering, the layout of pharma rooms and equipment drawings is fundamental and significantly reduces the amount of hours used for modelling.”

On a typical Process Service project, the structural part of the model is developed with another software package. It is converted into an IFC file and imported into the project. Pharma rooms with doors, windows, and counterceilings are done in the same way.

Developing new piping components

Alessandro underlines the importance of being able to develop new piping components when needed. Process Service has cooperated with CADMATIC support to develop

two new piping classes that were not present in the standard library.

“We developed sanitary class pipes and valves according to the ASME-BPE standard and PT-FE-class pipes, components and valves according to the DIN 2848 standard. We created the components and rules for piping modelling from scratch. We can now model and extract final documentation for piping, the plant and sketches with excellent results,” says Alessandro.

When asked about other CADMATIC features they appreciate at Process Service, Alessandro highlights the ability to clash check across different disciplines. He indicates that clashes are often the first source of problems in pharmaceutical plants.

“The clash check tool works well, also with imported objects. With the use of the tool the probability of making errors is very low”.

Process Service are also very satisfied with the material list extraction.

“We can extract the material lists according to various criteria very quickly. It is not only fast, but we can do it at any stage of the project,” Alessandro concludes.



More about Process Service

Process Service was founded in 1986 by a group of chemical process specialists.

The company has grown steadily throughout the years and currently offers comprehensive design services for new fine chemical and pharmaceutical plants or plant revamps.

The company works together with clients' departments to optimize the process routes and plant definitions with an

integrated comprehensive approach to process design and safety.

Key service areas:

- Process development & feasibility studies
- Basic design package and investment cost estimates
- Detailed engineering and procurement
- EPCM contract
- Construction supervision

- Pre-commissioning
- Commissioning and start-up activities

Process Service plants:

- Fine chemical plants
- API production plants
- Highly potent – API laboratories and production plants
- Sterile API production plants
- Pharmaceutical plants
- Biotechnology and fermentation plants



Augmented reality with eShare for HoloLens

Behind the scenes of AR technology application in design review

CADMATIC customers have shown an interest in virtual and augmented reality technologies for some time. Typically, the interest has not been very specific. It has been fueled by the development of new technologies and hardware, and a desire to try something new.

A few years ago, CADMATIC did not consider the technology feasible yet, but has kept abreast of developments in the field. This article follows the development of AR technology and its application in CADMATIC, culminating in the launch of eShare for HoloLens.

The launching of the first version of Microsoft HoloLens in early 2016 proved to be the point where augmented reality technology seemed mature enough to convince CADMATIC developers to try it themselves. At the time, purchasing MS HoloLens was no easy task.

"Ordering the first headset in any of the countries where we have offices proved to be impossible, or at least extremely complicated. Eventually, we managed to order it from Ireland directly from Microsoft. We wanted to see how it would fit with our information management products and how it could possibly expand the design tools and techniques," says Mikko Ylikäinen, Product Owner, Information Management Applications.

Early experimentation

The CADMATIC product creation team started experimenting with HoloLens as soon as the package arrived at the office, but the actual development had taken its first steps already before that: They had a prototype version that allowed users to see a 3D model in AR.

"Almost everybody in the office wanted to try HoloLens during the first couple of days. The technology was still very much state-of-the-art, despite the availability of several similar cheaper devices. It was

funny to see people walking in the corridor wearing a headset and not responding immediately to others," Mikko describes the first days after the arrival of HoloLens.

Finding the right focus areas

In the beginning, the development team had a long list of ideas how CAD models could be utilized with the headset. They held many discussions with clients about the technology and development possibilities were considered before the scope was limited to a manageable size.

It became clear that the first priority was uploading 3D models to HoloLens and the need for basic review functions. These included getting object attributes, measuring distances and aligning digital models with real objects, i.e. taking 3D models to AR and keeping information already available on top of the 3D geometry. The most suitable platform for this proved to be an eShare server, where all the project data is connected centrally.

"We wanted to present the new developments at the bi-annual Users' Meeting in September 2018. Firstly, to share our excitement with our customers, and secondly to discuss possible use cases. This posed some time constraints to get it ready and published to the Windows Store. Prior to the event, we had several use cases in mind that are typical for reviewing 3D models of new and revamp design projects. We already have significant expertise in our company to create and use 3D data for various purposes. All we needed to do was to

extend our imagination with the possibility to see the 3D model in its real size and in a real environment, not on a screen," Mikko Ylikäinen describes the development leading up to the UM 2018.

"Almost everybody in the office wanted to try HoloLens during the first couple of days."

The team noticed that HoloLens immediately changes the perception of 3D and space. For example, one part of a test model with a platform with some piping may seem like a small piece in a design application and eBrowser, but once loaded in HoloLens it was far too big for the spacious office corridor.

The whole idea of modeling, originally based on the "eye to hand to brain" concept, changes with HoloLens.

"When you see the actual scale of the design in a live environment it boosts your imagination. It lets you experience changes the project is about to bring," says Mikko.

Launching CADMATIC HoloLens

The team presented the new HoloLens application in workshops at the UM 2018. The immediate feedback was very positive.

"It was great to see how excited people were. The feedback we collected provided us with even more inspiration to continue. The possible use cases raised during the discussion varied from possibilities



In augmented reality, the headset projects computer-rendered 3D holograms into the user's view, but the users are still able to see their real environment, whereas virtual reality headsets show a 360-degree view of computer-generated content. The holograms hold their position as the user moves around them.



Mikko Ylikäinen shows a customer at the 2018 Users' Meeting how 3D object data can be viewed.



Mikko Ylikäinen, Product Owner, Information Management Applications

to use the product for design reviews, show designs to stakeholders, involve people in remote locations, building process controls and simulations, replacing small scale laser scanner use, all the way up to abandoning the use of paper drawings, as well as installation and production instructions,” says Mikko.

“When you see the actual scale of the design in a live environment it boosts your imagination.”

Even the most experienced designers like to see projects in the building stage, to get a real feel of what is being designed. It allows the designer to experience the actual environment and to notice mismatches, impossible designs or ergonomic issues. All of this is now possible without costly

and often impossible trips to construction sites. A new project can be reviewed and presented in the most realistic way to stakeholders even before it is approved or constructed.

AR technologies are currently not the core focus of CADMATIC's development plans. The development adheres to agile principles, however, and the development team always keeps looking for new ways to provide benefits to customers.

“We focus on solutions to design projects and enable building and production in the most cost-efficient way. Extending the limits of traditional design solutions with information management platforms where all project-related data can be connected, allows our customers to save time. It ensures the availability of data that is structured in a natural way with the 3D model as the hub. It also helps customers to eliminate costly design mistakes,”

Mikko Yllikäinen explains the development focus.

The future – challenging design limits

AR solutions open the door to challenging traditional design limits and truly awaken the imagination. New technologies are coming onto the market more quickly and conveniently than before. Trying these new technologies and selecting those viable for implementation are part of everyday business at CADMATIC.

“As an innovative company we try to remain at the cutting edge with new hardware, new coding libraries and smart and enthusiastic people – it's all part of the CADMATIC culture. We embrace young talents as the company rapidly grows and experiments with the latest technologies to see what best fits our goal of serving our customers and remaining the most innovative CAD provider out there,” Mikko concludes.

eShare for HoloLens – Key facts

eShare for HoloLens is an app that allows the user to interface Microsoft HoloLens* with CADMATIC eShare. It offers an entirely new interactive design and engineering experience in Augmented Reality where digital 3D models reside in the real-world environment.

- Load models from the eShare server and use them offline
- Align 3D model with existing environment
- Load and visualize object data from eShare or any connected system
- Measure distances between

- digital items, digital and real items, or just real items
- Shared experience for collaboration in multi-user environment
- The app is free of charge for users of CADMATIC eShare version 2018T3 and higher



Photo © depositphotos.com/Jirsak

Intellectual Property Rights

Ensuring protection in distributed CAD projects

Due to the growth of project complexity and the rising demand for digital 3D models and construction data, the most valuable intellectual property of organizations is increasingly stored in digital project environments. This raises a critical question: How can we best protect intellectual property rights (IPR) in distributed CAD environments?

Simultaneous access to 3D models and the ability to share designs through viewer files are some of the most important features of modern CAD systems. These features are business-driven: organizations often need to outsource parts of design work to niche specialists or make use of the most competitive resources around the world. The implementation of distributed CAD design systems allows these goals to be achieved.

Access to highly valuable assets in distributed environments

Through sharing 3D models and related data, companies provide access to their most valuable assets. At the same time, they also gain access to external knowledge and expertise. Besides well-known concurrent design tools, most modern CAD software enable work in a distributed environments where participants from different companies and locations have access to the same CAD project data. This process is normally backed up by various legal agreements and contracts, often including a Non-Disclosure Agreement. Are these measures sufficient though, and what role can CAD play in this regard?

It must first be acknowledged that CAD software providers are no longer only suppliers of design tools. They have become deeply embedded in the value created during the life cycle of a design project and beyond: CAD software has evolved into being a hub of knowledge. It stores libraries of parts and fittings according to various standards, in-built design rules and specifications, predefined modules and typical units.

The role of CAD in plant design projects and asset management is evolving slowly, yet steadily. There is a shift from knowledge facilitation or simple

modelling to knowledge sharing, and in this context, also knowledge protection.

IPR in CAD distributed projects

Plant CAD software vendors have to balance the conflicting needs of facilitating knowledge creation and information sharing and the need to provide IPR protection. Little help is being provided by regulatory frameworks. The EU regulations for IPR in CAD software, for example, do not set particular conditions for data sharing within distributed CAD environments. This leaves CAD providers to decide how to ensure customers' IPRs are protected without damaging the fragile value co-creation process in design and subsequent asset life cycles phases.

Through sharing 3D models and related data, companies provide access to their most valuable assets.

The first port of call is identifying possible sources of information leaks. The amount of interfaces between software tools has grown strongly in recent years and naturally deserves scrutiny. Traditionally, software vendors have avoided building interfaces to other vendor's products, precisely as they have tried to avoid disclosing their database structures and providing access to their core data. However, the development of neutral data formats such as IFC, JT or STEP has mitigated these concerns. The interfaces are often separately licensed and can be easily controlled with simple administration settings.

A similar process was seen with mechanical CAD, albeit a significantly simpler one. Mechanical

CAD models are "lighter" and do not contain as much topological data and metadata as is commonly found in industrial plant design. It is, as such, much easier to integrate Mechanical CAD with PDM/PLM software than with the CAD model of a complete plant that includes all engineering disciplines.

Restricting access to project data

The most common mechanism used to safeguard sensitive information is to restrict access to certain areas or parts of databases. So-called filtered replication provides access control to connected sites.

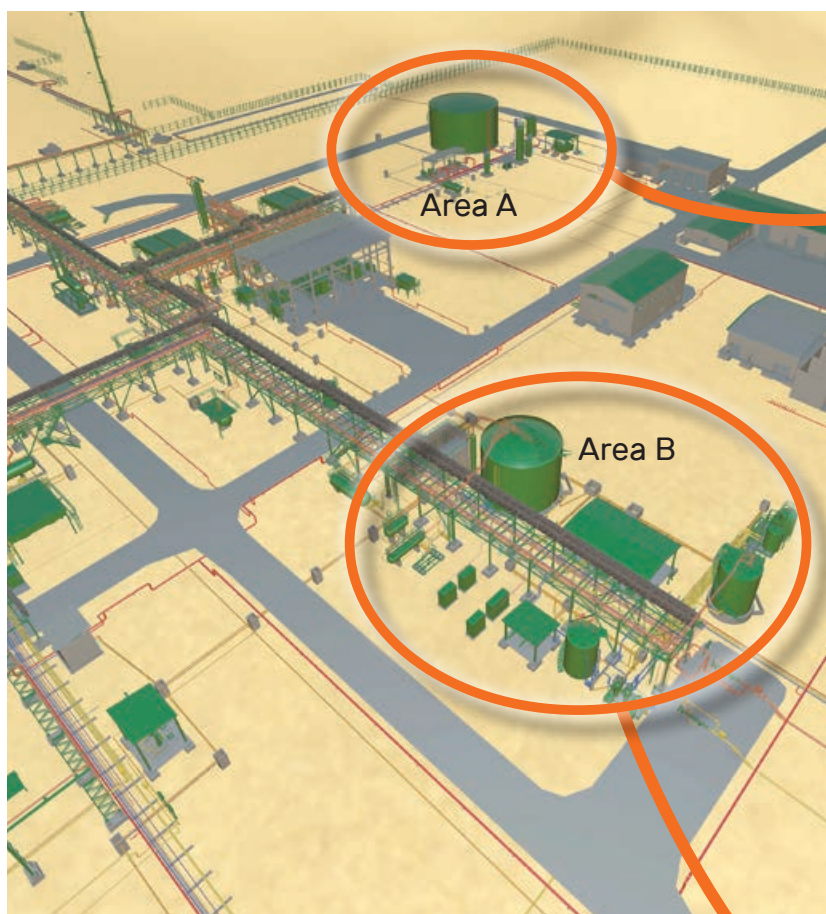
The main design company in a project, for example, can control what parts of the project are visible to other participants. This process is often complex and requires additional definitions and system setup. However, it could be approached from the designer's perspective: using 3D space limitations to define an area. This approach is familiar from the way a design team's work is separated. It ensures the integrity of the design by placing the responsibility for each area inside the team and controlling only overlapping areas where all teams are involved. See figure 1.

Controlling content of viewer files

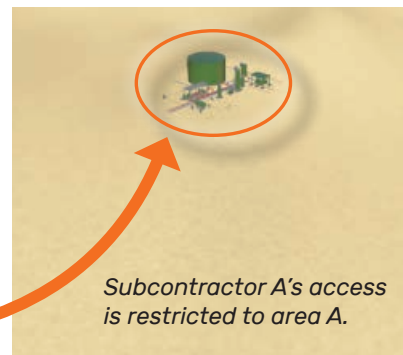
Business managers and other participants less involved in the core design process commonly make use of 3D viewers to access design features. These files contain a limited amount of data and do not pose a large IPR risk. Design solutions used in particular areas may nevertheless be considered valuable assets to the design company, and should be protected.

A filtered replication process, as described earlier, can be used to

Complete design model



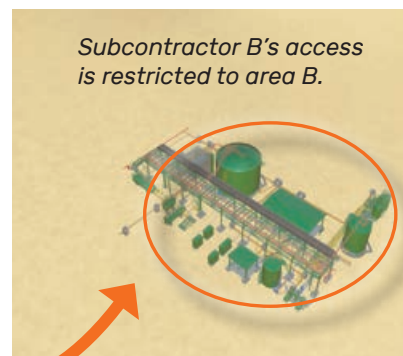
Replicated model: area A



Subcontractor A's access is restricted to area A.

Only area A is replicated.

Replicated model: area B



Subcontractor B's access is restricted to area B.

Only area B is replicated.

Figure 1. Filtered replication: If a company prefers a subcontractor to only have access to their parts of the project, it is now possible. Subcontractor A works in the replica A area and subcontractor B in the replica B area.

restrict the content of viewer files on a particular site only to selected areas. The validity of viewer files can also be restricted to provide an additional security layer. The owners of designs often require access via 3D virtual walk-around during the design and construction phases, but wish to restrict access

to the entire model after the project is completed to avoid copying of their design solutions.

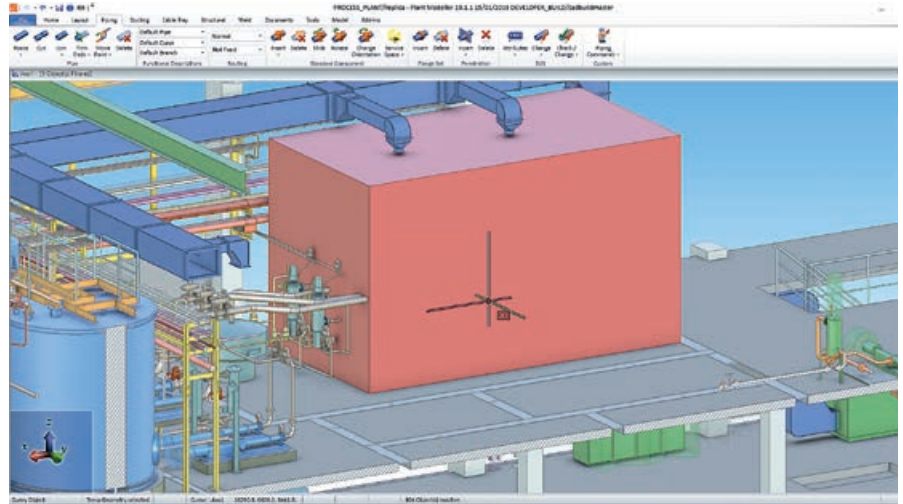
CADMATIC approach to IPR

CADMATIC's distribution design solution is based on a smart database-centric client server system that efficiently stores 3D plant

models, documents and component libraries in master and replica databases hosted by a database server system.

Ensuring the integrity and security of project data at all times receives the utmost priority. In globally distributed projects, data is updated at set intervals between

Figure 2. A visual deny box in a 3D model – restricted area in replicated distributed project.



remote design sites via an online network such as a secured internet connection, or by simply exchanging the file in an email attachment.

CADMATIC provides filtered replication to protect intellectual property rights. If a company prefers a subcontractor to only have access to their own parts of the project, it can be implemented without additional licensing or tools. The project replication setup can include a filter for 3D objects via a 3D box based selection. This way, the remote design team only has access to the part of the 3D model needed for their tasks.

With filtered replication, subcontractors have access only to designated areas of the project, and cannot publish viewer models of the whole project. When drawings are created, it is possible to use drawing mask boxes to restrict visibility in drawing views. Objects that are completely inside a mask box are not shown in drawing views. Objects that are partially inside a

mask box are clipped in the visualization and the part of the object inside the box is not visible. Expiration dates for viewer files provide the possibility to control access to the design solutions after completion, which ensures that outdated files are not used.

CADMATIC's easy-to-set-up replication mechanism without extra modules or fees has effective tools to protect the IPR of 3D designs.

The CADMATIC approach provides all users with an easy-to-set-up replication mechanism without extra modules or fees, as well as effective tools to protect the IPR of 3D designs.

Conclusion

The increased sharing of data during and after design projects, as well as the growing amount of integrations between software products have enhanced the need for IPR protection. Providing efficient mechanisms to protect IPR within distributed environments and ensuring data filtering according to access rights are non-negotiable.

At CADMATIC, we have developed tools that allow design owners to efficiently control access to their designs and thus protect their most important assets. The use of filtered replication technologies is a core component of the CADMATIC distributed design solution.

This article is a shortened version of the paper: 'Protecting Intellectual Property Rights in Distributed CAD Environments' by Ludmila Seppälä (MSc, MBA) presented at the 18th International Conference on Computer Applications in Shipbuilding (ICCAS), Singapore, 2017.

CADMATIC is a leading 3D design and information management software developer and supplier for the marine, process and energy industries.

- CADMATIC's main offices are located in Turku, Finland and Groningen, the Netherlands.
- We have staff in Australia, China, Hungary, India, Italy, Russia, Singapore, Spain and the UAE.

- We have certified resellers and support partners in 15 countries in Europe, Asia and America. Our growing customer base includes over 1000 customer organizations in 58 countries.



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