<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>1972</td>
<td>TNO department of computational mechanics</td>
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<tr>
<td>1975</td>
<td>Start of DIANA (Displacement ANALyzer) as a service</td>
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<td>1980</td>
<td>DIANA commercially released in the Netherlands</td>
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<tr>
<td>1984</td>
<td>Establishment of DIANA User Association</td>
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<td>1988</td>
<td>DIANA’s first international sale (Germany)</td>
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<tr>
<td>1991</td>
<td>Cooperation started with JIPS in Japan</td>
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<tr>
<td>1994</td>
<td>First International DIANA Conference</td>
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<td>1998</td>
<td>TNO partially acquires Femsys Ltd, whose core product FEMGV becomes the new pre-post processor for DIANA</td>
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<tr>
<td>1999</td>
<td>Integration of FEMGV as pre-post processor for DIANA, Launch of DIANA 7</td>
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<tr>
<td>2003</td>
<td>Start of TNO DIANA BV, subsidiary company of TNO</td>
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<td>2003</td>
<td>Merger between TNO DIANA BV and Femsys Ltd, with an office in Leicester UK</td>
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<td>2004</td>
<td>Opening of US office, TNO DIANA North America Inc.</td>
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<td>2005</td>
<td>Launch of DIANA 9</td>
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<tr>
<td>2005</td>
<td>Cooperation started with Midas IT</td>
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<tr>
<td>2006</td>
<td>Opening of TNO DIANA UK Office in Woking (London)</td>
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<tr>
<td>2007</td>
<td>Launch of DIANA 9.2 with the new pre-post processor midas FX® for DIANA</td>
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Shams Tower, Dubai, Artist impression
Mission
Since the start of DIANA in the early 1970's, it has been our mission to enable our clients to solve the most complex engineering problems and in doing so become experts in their engineering field.

Engineering Heritage
TNO DIANA BV was established in 2003 from the Computational Mechanics department of TNO’s Building and Construction Research Institute in the Netherlands. TNO is one of Europe's largest independent Research Organizations. Currently TNO DIANA has offices in The Netherlands, United Kingdom and the United States. Our core expertise is Numerical Analysis applied to Civil and Geotechnical engineering. Analysis of Concrete, Composite and Masonry Structures and the interaction between these Structures and the Soil have become our specializations. DIANA is our flagship product.

TNO DIANA BV consists of a team of highly skilled and experienced engineers, mathematicians and software developers. Together with the DIANA Users Association this team forms the heart of the DIANA network.

Source of New Developments
DIANA has established an international reputation for providing the highest standard of analysis capabilities. DIANA offers a wide range of analysis functionality with the possibility of solving complex engineering problems. The open structure of DIANA makes it the best tool to investigate new or unforeseen territories. For more than 15 years, over 250 Universities and Research Institutes worldwide have used DIANA to test innovative ways of engineering or solve complex and challenging problems. Exchanging knowledge has made DIANA what it is today and created a valuable database of scientific papers and articles on numerous topics which has been a constant source of new developments in DIANA and inspiration for our users.

International Reputation
DIANA is used regularly by Expert Engineers within Engineering Consulting Companies across the globe. Organizations such as Taisei Corporation, DHV Group, Halcrow Group, Royal Dutch Shell, Halliburton, Sumitomo Mitsui Construction are just a few names of the worldwide DIANA User Community that benefit from the expert functionalities of DIANA.

Next Generation Engineering Software
In December 2005 TNO DIANA has entered a partnership with Midas IT, the Market Leader for Civil Engineering Software in Asia, and jointly developed a new state of the art pre-post processor, midas FX+ for DIANA. The partnership between TNO DIANA and Midas IT creates a totally new generation of Engineering Software. Using the strengths of both companies we have extended our product portfolio with new innovative application oriented software for Bridges, Buildings Geotechnics and Tunneling.

“We have experienced DIANA as a powerful and complete solution for simple to complex linear and nonlinear engineering problems. The ability to implement for example User Supplied Subroutines makes DIANA a perfect fit for our needs.”
Dr. A. Vervuurt, Senior Researcher and Ir. H. Burggraaf, Researcher, TNO Built Environment and Geosciences.

About us
Scientific Expert Network
DIANA has been developed by and for Expert Analysts and Engineers to solve the most complex problems. More than 250 top researchers worldwide, such as University of Tokyo, Stanford University, Imperial College and Delft University, are using DIANA to create solutions for the most challenging engineering problems. Together with the DIANA User Association we cooperate with this network to enhance DIANA and Midas products to continue offering state of the art solutions in the future.

DIANA FEA Library and Expert Forum
To facilitate for the Expert Users of DIANA, we have created a library of scientific articles, theses, and other publications. This database will allow the user to learn from other user’s experiences and quickly search for related studies. This Expert Forum enables the User to contact either the author of a publication directly or discuss a topic with other users or with the DIANA team.

Global Support Network
TNO DIANA continuously selects and trains highly skilled Engineers to represent and support the software worldwide. Through our offices and agents around the globe we support DIANA, DIANA related products, midas Gen, midas Civil, midas GTS and midas DIANA FEA.
Generating Innovative Application Tools

Our Philosophy has been to develop high quality application tools tailored to the needs of every engineer. For this we have created a product portfolio of both general and specialist tools. With DIANA as an expert analyst tool and research platform, we are able to create new knowledge together with our clients. After validation this knowledge can be implemented in the application oriented products co-developed with Midas IT.

TNO DIANA Product Philosophy

With DIANA we offer a powerful tool that allows the expert analyst engineer to solve the most complex problems in the field of civil engineering. DIANA is based on an “all-in-one” strategy which grants the user complete freedom in the level of detailing and complexity of modelling, from concrete cracking to soil plasticity and from non-linear dynamics to coupled flow-stress analysis.

For more common engineering design problems we have created, in partnership with Midas IT, an intuitive suite of application oriented products able to serve engineers throughout the entire civil engineering community.

“...the experience and knowledge embedded in DIANA have been an inspiration for Midas IT and will contribute greatly to the development of new FE Engineering tools. Jointly we will offer a full range of unified products and services worldwide.”

Sang Shim PE, Vice President, Midas IT

With our portfolio we are able to serve the entire Civil Engineering community by creating a coupling between DIANA and midas FX+ for DIANA the Graphical User Interfaces of all the products are unified.
DIANA Programs

“Most of worldwide famous FEM programs are not Civil Engineering oriented. For this reason we have introduced DIANA in our company more than 10 years ago. Since then we have been using DIANA successfully for Concrete Structures, Underground Tanks and Soil Analyses.” Mr. M. Nakayama, Dr. T. Iizuka, Taisei Corporation.

DIANA for structural engineering
Expert analyst engineer
Building, bridge, geotechnical, detailed analysis, forensic analyses

The ultimate solution for the analysis of RC, steel and masonry structures
Capture the complexity of the real world!
DIANA is an extensive multi-purpose Finite Element software package that is used by expert analysts and engineers to analyze a variety of technically challenging problems that arise in a wide range of civil engineering disciplines. DIANA has established a reputation for providing the highest standard for analysis of:
• concrete and reinforced concrete structures
• structures under dynamic and earthquake loading
• young hardening concrete
• masonry structures
DIANA is used by the world’s leading universities, research organisations and engineering companies.
The open and transparent structure of DIANA makes it an ideal tool for experienced engineers to create their own sub-routines for unusual situations and enables the user to directly control and influence all stages of the analysis. DIANA offers solutions where all other softwares fail.

DIANA for geotechnical engineering
Expert analyst engineer
GEOTECHNICAL ENGINEERING

The ultimate solution for soil-structure interaction analysis
Capture the complexity of the real world!
DIANA’s unique combination of structural and geotechnical analysis features makes it an all round engineering tool. The combination of:
• soil-structure interaction with non-linear behaviour for both soil and structures
• coupled stress-pore pressure and stress-temperature analyses
• advanced dynamic analysis features for earthquake and vibration
• extensive element library which offers a complete set of 2D and 3D elements
makes DIANA a unique tool to understand and solve the complex challenges that structural and geotechnical engineers face.

DIANA for Oil & Gas Engineering
Analyst engineers / reservoir engineers / geophysicist
OIL & GAS

Assisting optimal production of Oil & Gas
DIANA has been chosen by major players in the Oil and Gas industry to analyze and improve the safety and economy of subsurface operations. At the regional scale, DIANA allows engineers to carry out 3D geomechanical analyses of reservoir depletion including non-linear compaction hardening, activation of slipping faults, behaviour of salt domes and determination of hot spots for drilling. At the well scale, DIANA has unique abilities to predict borehole stability, casing integrity and sealing leakage. For completed well mechanics, DIANA offers equally powerful material models for rock, concrete, steel and rubber, which are the keys to optimizing the design of composite structures. State-of-the-art Finite Element techniques and constitutive material models are continuously updated to provide the latest research developments to the oil and gas industry. Fully coupled models including the combined effects of deformation, fluid flow, temperature and concentrations, enable DIANA users to investigate the complex chemo-mechanical phenomena arising in the well bore vicinity.

DIANA Programs

Bridge segment with post-tensioning tendons
Embedded pile elements, Shams Tower, Dubai
Detail of clamp in platform construction
3-dimensional terrain modeling
“Traditionally, we would only deal with compaction issues with one dimensional analysis so calculations were far simpler and certainly couldn’t cater for effects like arching. With Geomec we have reduced calculations that would have taken at least two months to just a couple of days.” Cor Kenter, Principal Geomechanics Specialist at Shell International Exploration and Production BV.

**Geomec**
Analyst engineers / reservoir engineers / geophysicist
**GEOMECHANICS OF OIL & GAS RESERVOIRS**

**3D Specialist software for Reservoir Engineering**
The purpose of the Geomec software program is to analyze the geomechanical behaviour of a depleting oil or gas reservoir. From 3D geological information a 2- or 3D Finite Element model is generated automatically and analysis and results interpretation and processing are all done easily within this application. Geomec is used by experienced Geologists within the Oil & Gas Industry. Geomec is a joint production between the Exploration and Production Centre of Royal Dutch Shell NV and TNO DIANA BV.

**D-Stabor**
Analyst engineers / drilling and well bore engineers
**BOREHOLE STABILITY FOR THE PRODUCTION OF OIL/GAS**

**Predicting Borehole Stability**
D-Stabor performs a series of analyses at different locations along a borehole in order to assess the sensitivity of borehole stability to different mud-weights. Stresses, pore-pressures and material characteristics along a well can be automatically imported from Geomec, defined by the user in a spreadsheet, or input directly in D-Stabor. These parameters are then projected onto a complete plane-strain Finite Element grid of a cross-section of the borehole. Critical mudweight loadings are estimated and D-Stabor performs an elasto-plastic Finite Element Analysis in which not only the onset of failure but also the stability beyond the onset of plasticity is calculated. D-Stabor is a joint production between the Exploration and Production Centre of Royal Dutch Shell NV and TNO DIANA BV.

**DIANApipe**
Analyst engineers
**PIPELINE ANALYSIS**

**Combining beam and ring action in pipelines**
Finite Element Analysis in Microsoft Excel

The protection of pipelines from ground movements and external loading is a typical challenge for which engineers turn to DIANApipe. Enclosing the powerful DIANA 3D Finite Element system, DIANApipe offers a tailored user-interface for the structural design of new pipelines and for the integrity assessment of existing pipelines. Vertical and horizontal bearing capacity of the soil and soil-pipe interaction with friction are all available. Pre-post processing is done directly in Microsoft Excel.

- Geological model with different rock formations
- Subsidence at ground surface and at top reservoir
- Plastic strains in a model analyzed in D-Stabor
- Pipe-line systems embedded in soil in MS-Excel environment
Midias Programs

**midas Civil**

*Design engineers/ analyst engineers*

**BRIDGE ANALYSIS AND DESIGN**

**Total Integrated Solution for Bridge and Civil Engineering.**

Midias Civil provides a distinctively easy user interface through its use of innovative graphic components. The System combines General Purpose Structural Analysis Features and Bridge Engineering-specific Structural Analysis Capabilities. It includes RC, Steel and Post-tensioned bridge Design, Suspension and Cable-Stayed Bridge Analysis, Integral Bridge Analysis and many other features such as Construction Stage Analysis, including Creep and Shrinkage, Push-over Analysis, Nonlinear Time History Analysis and Heat of Hydration analysis.

Midias Civil has been developed from a user’s perspective combining state of the art Graphical User Interfaces with Advanced Solvers reflecting the construction practice and continuously updated Design Code functionality.

**Contour plot of combined stresses in a Steel Arch Bridge**

**midas Gen**

*Design engineers*

**BUILDING ANALYSIS AND DESIGN**

**Easy, Intuitive and Fast tool for Structural Analysis and Design.**

The user-oriented input/output features and significant analysis capabilities enable practicing engineers and researchers to readily undertake structural analyses and designs even for complex and large structures. Midas Gen also provides design capabilities using various standards, such as AASHTO and Eurocodes, reflecting conventional as well as unusual design conditions.

**FE-mesh of conference centre**

**Frame-work model of stadium**

**Analysis of Composite Curved Steel Plate Girder Bridge**

**Model of a post-tensioned segmental concrete girder**

**Construction stage analysis of a high-rise building**

“Midas Civil is very user friendly, and the GUI, along with the available wizards, makes it easy to get an analysis project up and running quickly, regardless of its complexity.”

Drew Miller, PE. URS Corporation, Tampa

**Unconventional pedestrian bridge**
“I am impressed with the modelling capabilities of midas GTS and the level of post-processing features too. The running of the 37 staged nonlinear analysis of the 27000 element tunnel intersection in around 25 minutes on a 2GHz, 1GB RAM machine was also surprisingly quick.”

Dr Andrew Mar, Principal Engineer at Donaldson Associates Limited.

**midas GTS**

**Analyst engineers**

**GEOENGINEERING**

New generation solution for soil mechanics, geotechnical and tunnel engineering
Unlocks the power of 3D analysis for the design office!

Midas GTS is a fully integrated Finite Element system in which pre-processing, analysis and post-processing are achieved in a unified graphical user interface. User-friendliness, intuitiveness and speed of execution are at the heart of the midas GTS philosophy. Dedicated tools, such as the terrain geometry maker, the tunnel analysis wizard, the construction stage analysis wizard and automatic report generation render valuable gains in term of time and quality.

With unprecedented fast analysis speed obtained from the state-of-the-art solvers, midas GTS opens the door to 3D geotechnical analysis on your own PC.

**midas DIANA FEA**

**Analyst engineers**

**DETAILED ANALYSIS OF STRUCTURES**

Making Detailed Non-Linear Analysis easy.

Midas DIANA FEA is a detailed analysis program newly co-developed by Midas IT and TNO DIANA. Combining the extensive experience in non-linear analysis of DIANA with the application oriented expertise and state of the art user interface of Midas IT, a new generation detailed analysis program has been created. The analysis functionality is:

- detailed analysis of composite structures
- 3D detailed analysis of steel components and assemblies
- explicit modeling of reinforcement in concrete and other materials
- analysis of creep and shrinkage effects
- concrete cracking
- masonry analysis
- thermo-mechanical analysis
- fire effects on reinforced concrete structures
- special analysis such as fluid dynamics contact and fatigue

Midas DIANA FEA is a new generation Detailed Analyses tool for Structural Applications.
Pre- and Post Processors

midas FX+ for DIANA

Good pre- and postprocessors are indispensable in the world of general Finite Element packages. For DIANA we provide two different pre- and post-processor packages: midas FX+ for DIANA and iDIANA.

Midas FX+ for DIANA is a state-of-the-art pre- and postprocessor which meets today’s needs of practicing engineers. Because of the intuitive graphical user interface, complex Finite Element analyses become available in the engineers’ toolboxes. Complexity and user friendliness meet each other in DIANA with midas FX+ for DIANA.

FEMGV

FEMGV is especially suited for research and scientific applications where parametric studies are necessary. Powerful features such as scripting and easy geometrical definition are coupled with strong post-processing features like animated result views. FEMGV is used in many companies in Europe both for mechanical and civil engineering applications.

FEMGV is also the standard pre-post processor of DIANA, named iDIANA.

Dedicated pre- and postprocessing

Both midas FX+ for DIANA and iDIANA (FEMGV) are examples of general purpose pre- and postprocessing tools.

Many users appreciate that the dedicated midas products like midas Civil and midas GTS have a similar user interface as midas FX+ for DIANA, which makes switching between the products efficient.

For special applications TNO DIANA also develops tailored user interfaces. An example is FemPal, which has been developed in cooperation with the Pallet Racking Industry. FemPal has a dedicated graphical user interface for Finite Element analysis of pallet racking systems, which is based on FEMGV.

“Since we have started to use DIANA we have learned to appreciate the capabilities of this program, especially the extended analysis and material libraries. The development of the new pre-/post-processor, which makes 3D modelling very easy, makes DIANA a unique finite element package among the others available on the market.”  Simone Ferrario, Structural Engineer, Tecon S.r.l.
The engineers and developers of TNO DIANA can provide clients with customized solutions for structural, geotechnical, mechanical and petroleum engineering problems:

- Consultancy, which includes analysis with DIANA and the interpretation of results
- Development of specialized versions of DIANA with dedicated technology and accessibility
- Integration of DIANA with existing in-house software and work processes
- Assistance with model building in preparation of the Finite Element analysis

For more than 10 years Engineers at TNO DIANA have been chosen by major players in the Structural, Geotechnical and Oil & Gas Industries, such as Hyder Consulting, Shell International Exploration and Production BV and Halliburton Energy Services, to provide software and services for the analysis of structures, damaged buildings, excavations, foundations and sub-surface operations of Oil & Gas reservoirs. Consultancy work has been carried out on Engineering projects all over the world.

TNO DIANA’s Engineers have worked for many clients to provide expert opinions or deliver expert capacity for various projects such as:

- Design of Concrete and Steel Bridges
- Strength Assessment of Structural Details
- Progressive Collapse of Structures
- Forensic Analysis of Structures
- Foundation Design
- Soil - Structure Interaction of Piled Foundations
- Geomechanical Risk Analyses of Oil & Gas Fields
- Off-Shore Platform Damage Assessment
- Earthquake Engineering of Structures
- Liquefaction of Soil
- Dam Design and Failure Limits
- Design of LNG Tanks

"Using the team at TNO Diana was the most cost effective solution to the complex SSI analyses required for the Shams Tower foundation." Grahame Bunce, Technical Director, Hyder Consulting Ltd.