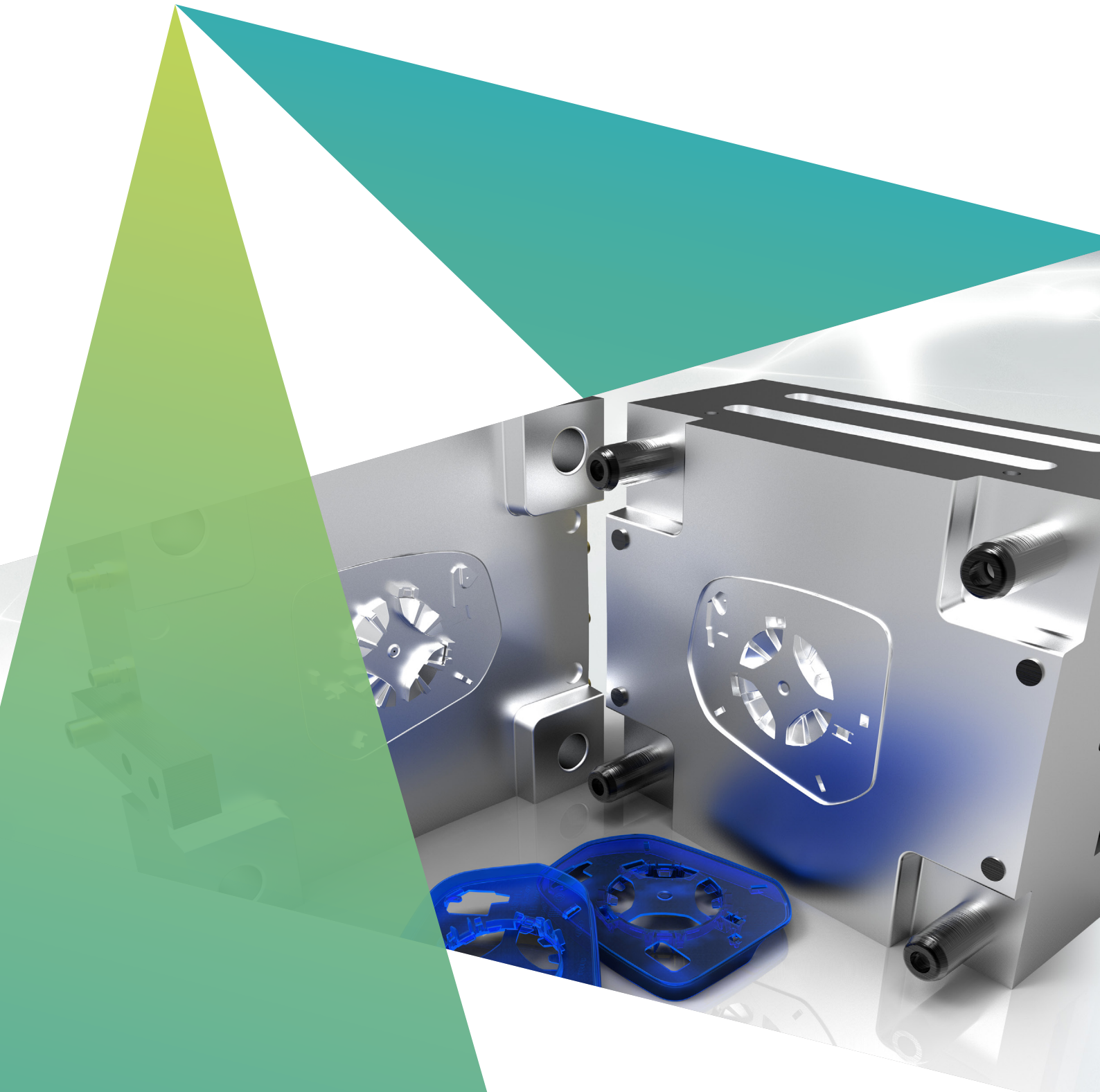
HEXAGON

Solution brochure

Solution for plastic injection moulds

Creating an end-to-end smart design and manufacturing workflow for plastic injection moulds



Competing in a challenging market

Plastic injection moulds are essential for industry verticals including automotive, foods and beverage, medical and pharmaceutical equipment, consumer products, electronics, sports equipment and agricultural equipment. The key challenges faced by the plastic injection mould industry include:

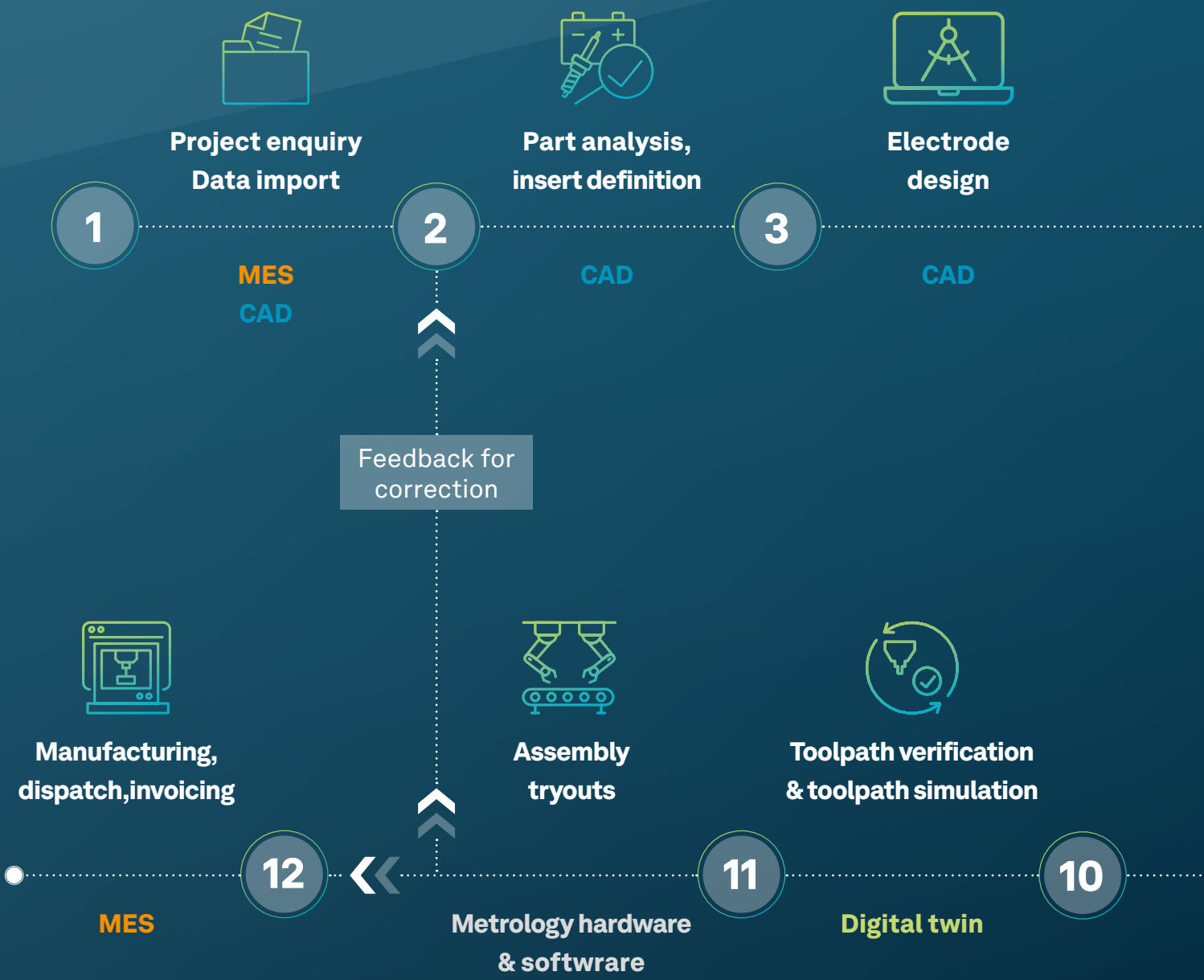
- Designing plastic injection moulds faster, considering manufacturing constraints and capabilities
- Optimising the manufacturing cycle time
- Ensuring smooth execution of manufacturing activities to meet the delivery date to the end customer
- Keeping track of revisions in the product design made by the customer
- Optimising the overall product and project cost
- Ensuring first time right manufacture every time and minimising rejection and rework
- Ensuring the quality of the finished product irrespective of operators' skill levels

Hexagon's end-to-end solution for plastic injection moulds addresses these challenges at each stage of the workflow from inquiry to dispatch using a smart design and manufacturing approach based on VISI products, WORKPLAN, NCSIMUL, Manufacturing Asset Management and metrology software and hardware.

End-to-end solution for plastic injection moulds

Smart design and manufacturing workflow

Collaboration design and manufacturing workflow



Digital twin
FEA
CAD for manufacturing
MES
CAM
Metrology hardware & softwrare

Mould design

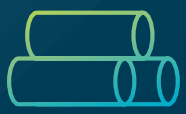
4

CAD
FEA

Flow analysis

5

FEA



Materials management Part-list

6

MES
CAD

Electrode programming

9

CAM

2.5 - 5 axis programming

8

CAM

Manufacturing planning and scheduling

7

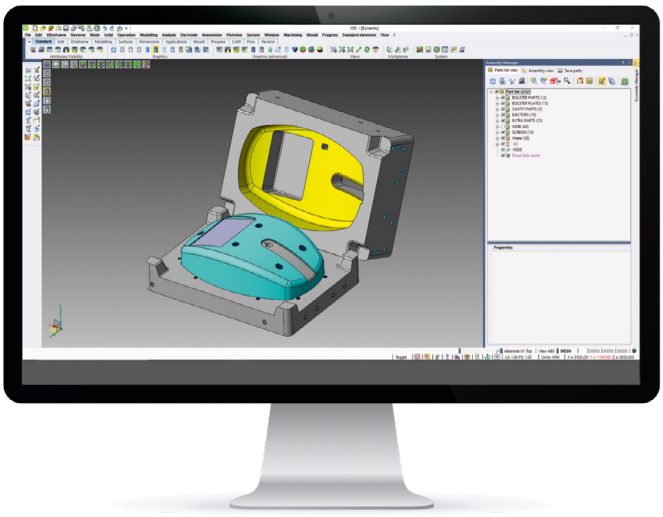
MES

1 Project enquiry and data import

Hexagon's WORKPLAN manufacturing project management platform provides users with the ability to manage the workflow, starting with the product enquiry.

Opportunities can be created in WORKPLAN and will maintain all details related to the customer – contact details, delivery, and invoicing addresses etc. Users can then keep track of the progress of each opportunity, including various communication details for the project.

For data import, Hexagon's VISI solution can work directly with Parasolid, IGES, CATIA, Creo, UG-NX,STEP, SolidWorks, Solid Edge, Inventor, ACIS, DXF, DWG, JT Open, STL and VDA files. The extensive range of translators ensures that users can work with data from almost any supplier. The ability to skip crrupt records during the import process provides a platform from where the most inconsistent data can be managed. Very large files can be handled with ease and companies working with complex designs will benefit from the ease with which their customer's CAD data can be manipulated



2 Part analysis and insert definition

Once the job is accepted, technical input from the customer, such as model files, must be validated for manufacturing feasibility and the model prepared from a manufacturing point of view.

DESIGNER is Hexagon's CAD application for smarter manufacturing and provides a variety of solid, surface, sheet metal modelling capabilities, creation of 2D drawings, electrode design, design automation through macros and scripting, and a link to Hexagon CAM software and reverse engineering functionalities.

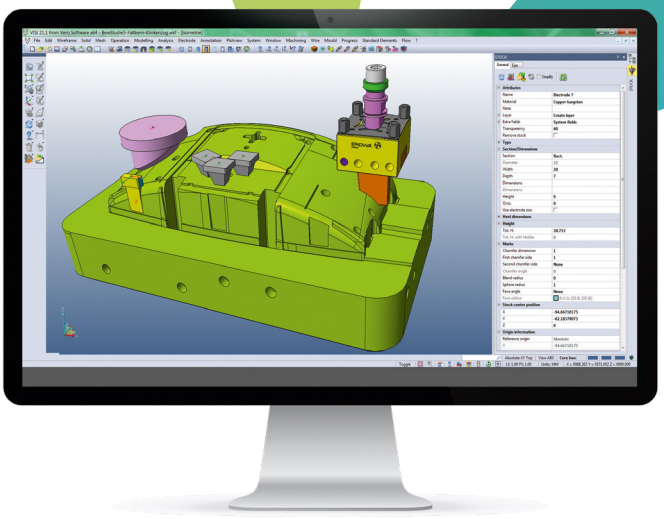
Large assemblies can be easily managed and analysed and split into constituent parts (disassembly) using DESIGNER. Several powerful sheet metal functions are available to prepare parts for unfolding.

DESIGNER also has functionality to correct the thickness, change bend radii and make changes to flange angles and lengths.

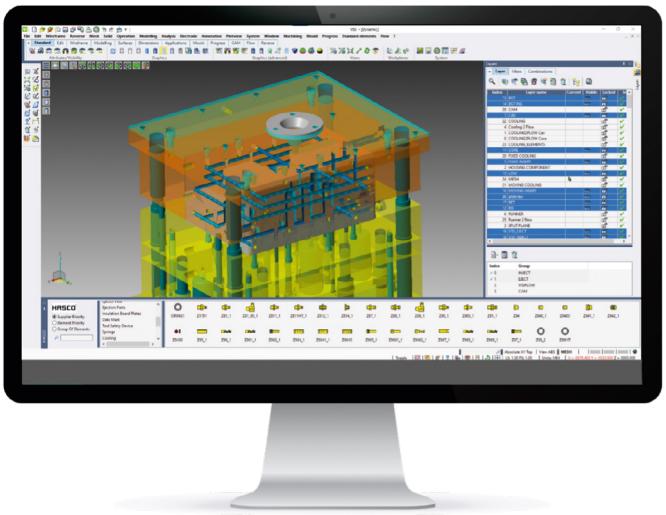
3 Electrode design

Using this automated module, users can create and manage design and manufacturing of electrodes and their holders for the manufacture of detailed and hard to machine features on mould and press tools. Comprehensive holder design, simulation and collision checking ensures that the electrode will operate right first time.

EDM electrode creation can be one of the most complex and time-consuming projects for any mould or die maker. This module offers a complete solution for electrode right from design to manufacturing. Even the most experienced electrode designer will benefit from the knowledge-based automation provided by this technology.



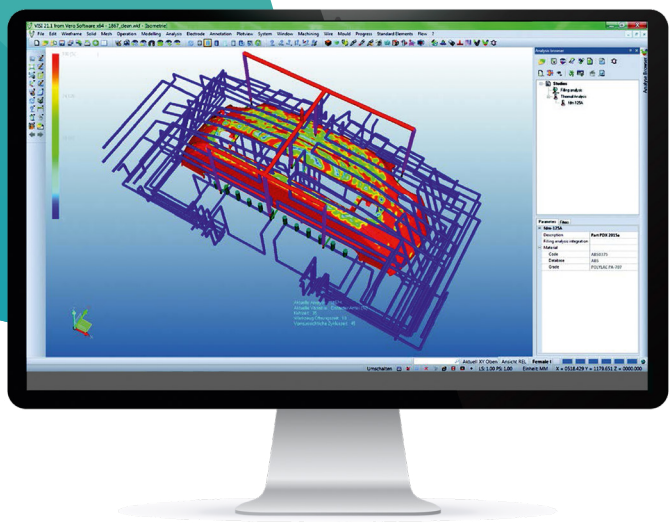
4 Mould design



VISI Mould provides the complete mould tool design solution based on industry specific automation that guides the user through the mould development process. Dynamic operation previews provide the designer with a ‘real-time’ view of how component changes will affect the tool design.

Parametric component libraries from all leading suppliers of mould components are also available.

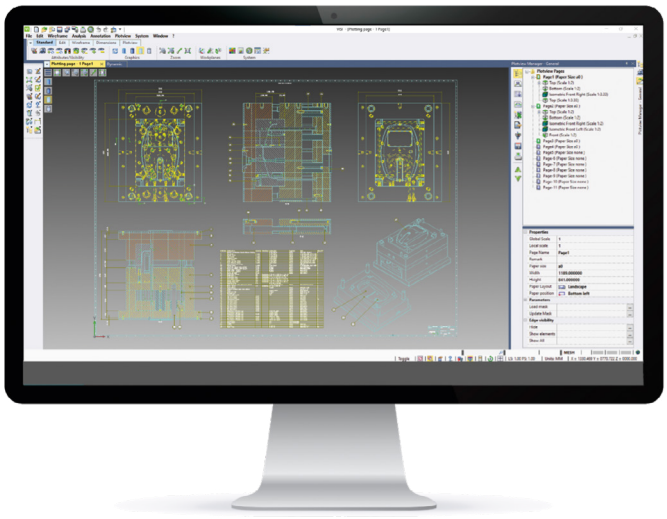
VISI Cooling & Kinematics capability offers full control over position and sizes with automatic proximity checks to ensure that cooling lines do not interfere with other. Moving parts can be checked using the kinematics commands suite.



5 Plastic injection moulding flow simulation

All areas of moulded component creation can benefit from the optimisation of mould tool design and moulding process parameters. Part designers, mould makers and moulders will all benefit from using Hexagon's innovative technology for injection simulation to achieve cost effective and reliable mould designs and the optimum moulding conditions.

VISI Flow is a unique prediction tool, ideal for pre-production and post-production analysis and concurrent engineering of injection moulded plastic components.



6 Materials management and part-list

WORKPLAN provides all the necessary features for the management of the complete purchasing process. This includes the purchasing budget requirements, the RFQs and stock management, purchase order receipts and supplier billing check and control functions. Reports are available in real time for stock on hand for projects and trace stock items in the system.

WORKPLAN automates the budget request and approval for raw materials, standard components, composed components, all the stock reservation and availability are checked in progress. Automatic import of detailed Bill of Materials (BOM) information from popular CAD systems is a time saver and helps minimise mistakes.

Using this module of WORKPLAN, manufacturers can ensure that all the required raw material and bought-out items are made available on time to meet the delivery date to the end customer. This also helps optimise the inventory carrying cost.

Using VISI CAD, user can create complete set of 2D detailed drawings generated directly from the 3D model. Any standard catalogue component will have the correct detail representation within a section view. Changes to the 3D model will result in modifications to the 2D view along with any fully associative dimensions. Part-list table items and their respective balloon references can be added to the drawing using dedicated assembly management tools.

7 Manufacturing planning and scheduling

WORKPLAN schedules projects and jobs based on set priorities and availability of resources. It supports forward looking simulations. Manufacturers can use WORKPLAN's GANTT charting to optimise workload, reduce bottlenecks, control milestones, and meet due dates.

WORKPLAN includes an easy to use drag and drop graphical tool to set routing order and create workflows. These workflows can be simulated for a set period, based on project due dates. Users can also set various internal due dates, to ensure tighter management and provide a buffer in the workflow. WORKPLAN automatically generates a resource load planning schedule, which considers existing available capacities.

Using these modules of WORKPLAN, various manufacturing activities can be planned, resources optimised, and progress tracked against the plan to ensure that the project is delivered on time as per the customer requirement.

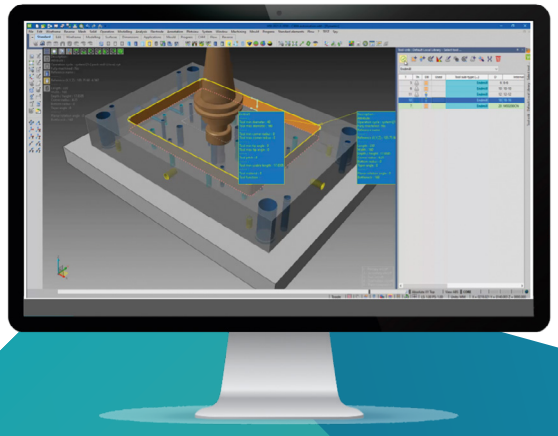
8 2.5 - 5-axis programming

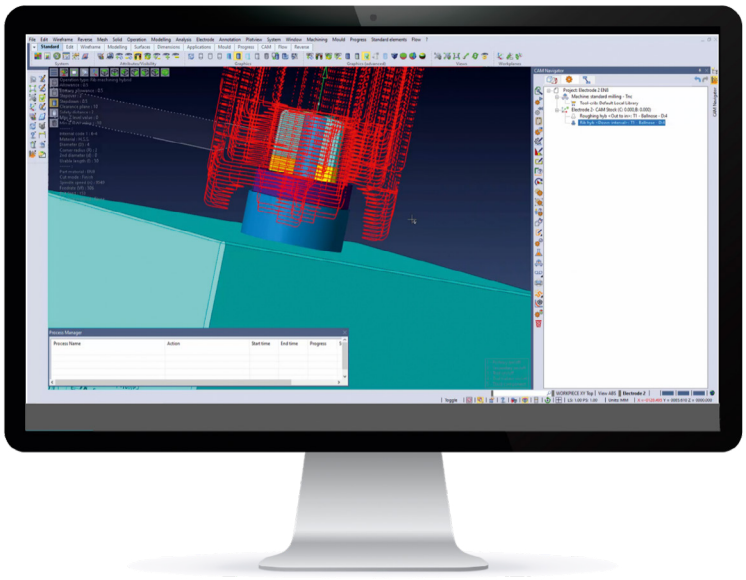
VISI Machining 2D
VISI Machining 2D provides a practical, intuitive, and simple solution for CNC programming including 4 and 5-axis indexing. Knowledge based feature recognition will automatically select features directly on the solid geometry and create reliable milling and drill cycle toolpaths.

VISI Machining 3D
VISI Machining 3D creates intelligent toolpaths on the most complex 3D parts. Dedicated high speed milling techniques and built-in smoothing algorithms create highly efficient NC code. Intelligent toolpaths will reduce cycle times on the machine, improve productivity and continuously produce high quality components.

VISI Auto Tilting
VISI Auto Tilting capability converts traditional 3-axis toolpath to 5-axis operations which dramatically increases the number of strategies available to cover any scenario. This approach applies high speed machining technology to 5-axis toolpaths providing intelligent collision detection. Benefits include faster cutting speed, increased rigidity (less vibrations) and better finishing quality.

VISI Machining-5-axis
5-axis machining has traditionally been regarded as advanced technology best suited to the aerospace and automotive industry. 5-axis machining offers many advantages, all of which are now being applied to the mould and die sector. VISI Machining provides the operator with a productive solution for creating highly efficient toolpaths with advanced collision control for the most complex 3D data.

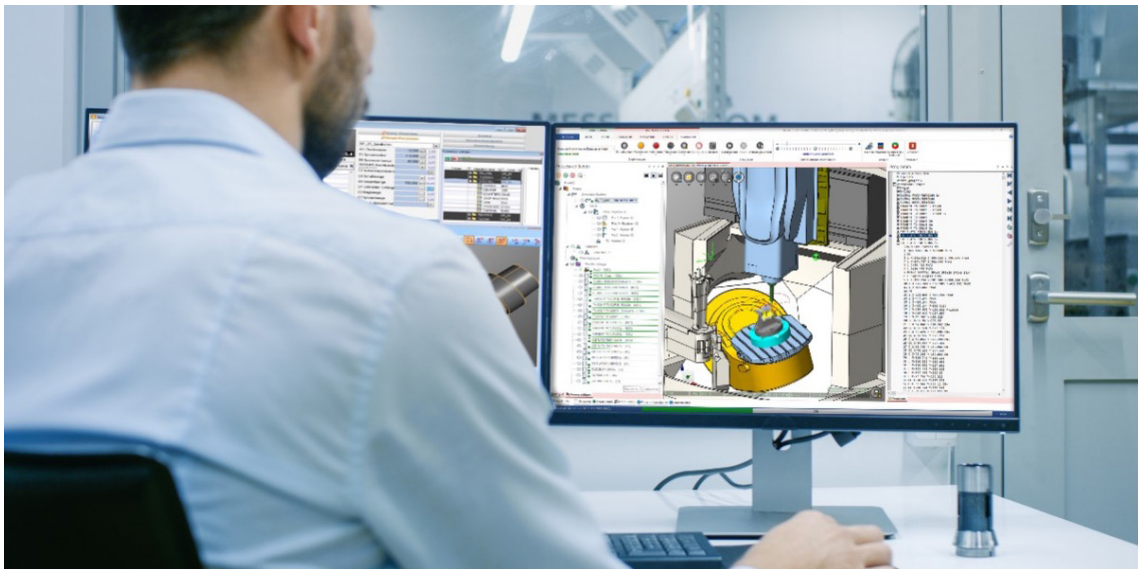




9 Programming for electrode machining

Once the electrode has been designed, it can be machined directly (without data transfer, or data losses) using VISI Electrode Machining module.

A datum for machining and positioning the electrode in the EDM machine is automatically created to ensure continuity throughout the entire manufacturing process. Machining templates containing tooling, tool path operations, feeds, speeds, depth of cut, can be stored for reuse on similar electrode families. Applying them to a new electrode will automatically create a new set of toolpaths using the same settings, greatly reducing programming time and using company standards which have already been proven on a previous job.



10 Toolpath verification and optimisation

NCSIMUL
NCSIMUL manages the complete machining process from the NC program to the machined part. Its capabilities allow users to fully master the shop floor and include automatic G-code reprogramming and G-code simulation. NCSIMUL virtually builds the real-life machining environment to eliminate errors, decrease set-up times, reduce manufacturing costs, and increase shop floor productivity.

NCSIMUL Machine
NCSIMUL Machine is a high-end CNC simulation software for G-code verification, machine simulation and tool optimisation. It detects programming errors and any potential collision from the same NC code that drives the CNC machine.

NCSIMUL Optitool
NCSIMUL Optitool analyses cutting conditions, dramatically reduces “air cutting”, optimises feed rates and allows users to create better cutting strategies. The overall benefits are a reduction in the production cycle times, enhancement of cutting operations and fast development of new G-code optimised files for future applications. This module allows users to optimise the tool lengths, air cutting and cutting conditions of NC programs (from 3- to 5-axis simulation software) and globally increase the quality of machining operations.

11 Assembly try-outs

Absolute Scanner
After manufacturing of the mould, the first sample plastic part produced by plastic injection moulding process can be scanned using Hexagon's Absolute Scanner AS1, and 3D point cloud data corresponding to the actual geometry of the part produced is collected. This set of data can be compared with a 3D model of the part to ensure that the actual part produced is within the acceptable tolerance limits using Inspire metrology software. If there are any major dimensional deviations observed for the first plastic part produced, then the necessary corrections can be made in the mould design.

Inspire
Intuitive and easy to use, Inspire is a comprehensive solution that makes measurement simple, saves time, and ultimately improves productivity. With one simple interface, Inspire works with any portable measuring arm or laser tracker for probing and scanning applications.

12 Manufacturing operations

Using time management functionalities within WORKPLAN, users can manage, and track time spent on all the projects. Data can be entered through touchscreens, workstations, barcode readers or timecards. This functionality can also help track and report on unproductive tasks, employee hours, time spent correcting problems or other quality issues, overtime, leaves, holidays and more.

WORKPLAN's Time Management module is an easy to use, all-in-one tool to manage employees' attendance, hours and track their progress on tasks. WORKPLAN helps check the times spent at each scheduled work centre on the project. Data can be entered from a computer terminal, touch screen, barcode readers or via manual input and timecards.

Using WORKPLAN, users can track the progress of various manufacturing activities and take corrective measures, if required, to complete the manufacturing activities as planned. The actual manufacturing cost of the project can also be monitored.

Hexagon's solution for industrial IoT device monitoring enables you to monitor the performance, availability and health of your manufacturing assets through the SFx platform. Asset Management is designed to maximise overall equipment effectiveness (OEE) and operational excellence indicators, either for a single device or for a set of systems, whether in real time or reporting over a period of time.

Inspection and dispatch

The quality module within WORKPLAN enables separate tracking of time and costs associated with non-conformities – the cost of poor quality.

This module is not only a great help to get the ISO certifications and meet ISO standard requirements mentioned in the quality management system (QMS), but it will manage supplier evaluation and give access to cross-functional features to improve quality and meet internal policies.

Additionally, the maintenance of measuring devices used in quality assurance, quality indicators and KPI analysis are key to achieving ISO Certificates.

Delivery notes can also be created once the project is ready to dispatch.

Invoicing

WORKPLAN issues invoice and manages the invoicing process.

Additional modules offer a view on cash inflow and outflow based on scheduled payments, as well as creating invoices for accounts receivable and ordered materials from accounts payable.

WORKPLAN performs detailed analysis specific to quotes, jobs, times, costs and other metrics with a few simple mouse clicks to improve the estimating and planning processes. It also enables comparison of the planned versus actual project cost and its components.

Seamless integrated workflow

Using Hexagon solutions – VISI products, WORKPLAN, NCSIMUL, and metrology hardware and software, plastic injection mould customers will have a seamless integrated workflow from the enquiry stage through to dispatch due to seamless exchange of data in terms of CAD CAM files and project related information, without any losses.

Integration between VISI and WORKPLAN
Allows bills of materials from VISI Mould to be imported directly into WORKPLAN solutions, ensuring that WORKPLAN can produce accurate, competitive quotations. WORKPLAN configures an import model in correlation with the file exported from VISI Mould, automatically importing the bill of materials.

The BOM import of VISI is done intuitively as the design progresses, making it possible to update the WORKPLAN project with a single click from the Assembly Manager. A synchronisation log makes it possible to follow the evolution of imports and to limit re-entries, which are always a significant risk of error.

Headline features include:

- Customised settings based on VISI configuration
- Import and automatic construction of technical breakdown from VISI native files as the project progresses
- Dynamic synchronisation with a single button click
- Synchronisation of standard components in common with the databases
- Synchronisation log
- Automatic production process creation based on keywords

The integration means users save time and can give a quicker response to customers, especially regarding raw materials, standard elements and stock supply management. Projects and their costs can be fully controlled, thanks to the import of the complete bill of materials tree structure.

The integration between above mentioned Hexagon products limits the risk of data input errors, guaranteeing reliability and accuracy when information is passed between them with just a few clicks.

Key benefits

Key benefits of Hexagon's end-to-end solution for plastic injection moulds include:

Optimisation of design cycle time

Better control over the quality of the product

Optimisation of overall product and project cost

Seamless integrated workflow for ease of use and faster training

Better resource utilisation for equipment and operators

Faster time to market, ensuring on-time deliveries to the end customer

Optimisation of manufacturing cycle times

HEXAGON

Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon's Manufacturing Intelligence division provides solutions that utilise data from design and engineering, production and metrology to make manufacturing smarter. For more information, visit hexagonmi.com.

Learn more about Hexagon (Nasdaq Stockholm: HEXA B) at hexagon.com and follow us @HexagonAB.

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