Made
in
Germany

3RRR
solutions

Get your solution.

English Version

INTRODUCTION

3R solutions offers both customized software that bridges the gap between engineering and fabrication, as well as automated turnkey pipe-shop solutions.

1982
First Isometric Software and RAMP Workshop Control (HP Workstation)

1985
Introduction of 3D Pipe Bending Simulation

1995
Full Software Port to Windows OS

1999
First RAMP for Paperless Workshop Control

2005
Multiple Software Packages for Paperless and Automated Pipe-Shops in Germany and surrounding Countries

2010
Major Turnkey Automated Pipe-Shop Project for Oil-Rig Fabrication in South East Asia

2013
Major Turnkey Automated Pipe-Shop Project for a Shipyard in South East Europe

2016
Multiple Integrated Software Packages and Turnkey Pipe-Shops Worldwide

What makes 3R solutions special?

► 3R solutions is unique in that we are both a developer of customized software, which bridges the gap between engineering and fabrication, as well as a designer of automated pipe-shop solutions. Unlike a traditional machine manufacturer or distributor we are independent, so we are not restricted to a single brand or catalogue, but can select the most suitable machine for each specific task or project.

► We have more than 40 years of experience in pipe-shop planning and software development.

► Rather than offer standardized "off-the-rack" software or systems, we create customized solutions for your specific requirements. Your feedback and suggestions are important to us.

► We have good relationships with leading machine manufacturers, allowing us to transfer data to many types of machines, as well as discuss adjustments to their machines to integrate them smoothly into automated fabrication processes.

► All of our developers and representatives have a solid understanding of pipe prefabrication processes, so we can discuss your requirements and expectations with you with a deeper background knowledge than a generalist software developer who works on a per-project basis.

What can 3R solutions offer you?

► Customized software solutions that take your specific requirements and processes into consideration

► Integration of engineering and fabrication processes

► Streamlined production planning and fabrication monitoring

► In-depth analysis of your pipe-shop requirements

► Pipe-shop layouts for optimized flow of material and process coordination

► Coordination and implementation of pipe-shop automation projects

► Personal support – you will generally have one or two contact persons assigned to your project, rather than being routed to the next available support person in some call-center

► Customized after-sales service plans – you decide what type of service you would like after warranty, and we create the appropriate plan

What are the key strengths of 3R solutions?

► Reliability

We will always strive to give the customer the best possible product and support. If his requests give us any cause for concern, we will inform him to the best of our ability to allow him to make an educated decision.

► Responsiveness

Whenever possible we will adjust the software to the customer's specific requirements, rather than offer a standard solution that only covers part of what he needs. We will always communicate with our customers and partners and try to consider their feedback and input as much as possible in our planning and programming.

► Respect

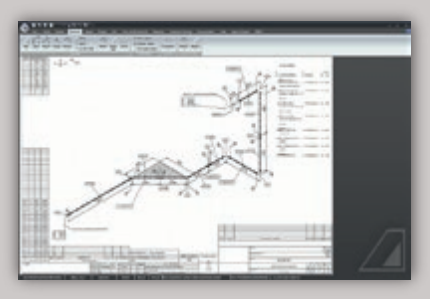
We will always deal fair and openly with all of our customers and partners. We will never sell a customer a product he does not need, or a functionality he does not require.

THE WAY OF THE SPOOL

From the first steps of the design stage to the installation of the finished spool, our software solutions aid you all along the way and beyond.

From the planning stage to installation, a pipe spool goes through a number of different processes. The 3R software framework offers a multitude of applications which can be used to streamline, facilitate and manage these processes.

Data from the engineering department (P&I Diagrams, 3D models) can be turned into isometric line drawings, which can then be further broken down into individual spools for fabrication using our automatic spool splitting algorithm, which is customized for each customer based on their specific requirements .



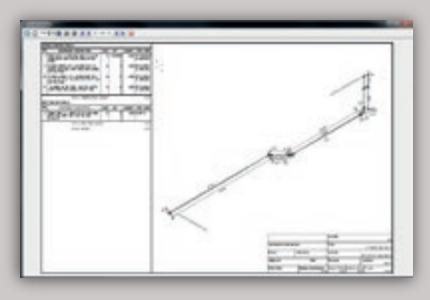
The software can then not only provide a wide variety of different reports, worksheets and documentation for these spools, but also the CNC data for the various machining processes.

Since the way of the spool through the factory itself is determined by its geometry, including the types of fittings required, our software can not only create optimized work packages for every spool, but also track the spool throughout the workshop. At each work station and machine the fabrication status is automatically updated, allowing constant monitoring of the spool's progress.

► The 3R software framework offers import interfaces to Tribon, Aveva PDMS, SM3D, NupasCadmatic, and many other 3D construction platforms. Isometric line drawings can be broken down into individual spools for fabrication, based on the customer's own parameters and logic.

► Features of the software also include the automatic generation of worksheets, part lists, reports and documentation for each spool. The reports can be customized and adjusted to fit the customer's formats. In addition the customer can specify other required reports or features, which can be implemented. These include for example Dia Inch reports, giving detailed information about each shop and field weld.

► To avoid idle times at any of the machines, the software combines multiple spools into work packages. Each work package is optimized to make use of the available machine capacities and capabilities. That means that while the way each spool takes is determined by its geometry, the order in which the various spools are processed is determined by machine capacity and internal logistics.



► In order to streamline the fabrication flow, the software generates all fabrication relevant CNC data for the processing machines, with automatic transfer in a format readable by the machine. This way no time is lost calculating the required lengths and parameters, and entering them manually into the machine. Instead the operator only has to confirm the data on his screen and start the process.

► Each pipe shop is different and unique. Therefore both the software and the hardware need to be customized to meet the shop's unique requirements. In order to do so, 3R solutions offers consulting services, which include an in-depth analysis of the current situation and the desired performance levels. Based on this 3R solutions will create an individual pipe shop proposal, which will outline the optimal workshop layout and configuration.

- **► Workload Balancing**
- **► Spool Splitting**
- **► Cutting Optimization**
- **► Bending Simulation**
- **► Customized Worksheets**
- **► CNC Data Generation**
- **► Progress Tracking**
- **► Welding Documentation**
- **► Report Generation**

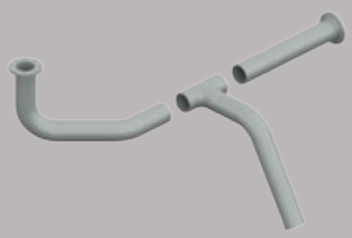
SCOPE OF 3R SERVICES

P & I DIAGRAM

As the schematics of the piping system are drawn at the start of the entire process, R2D automatically generates the symbol key, classification checks, part lists, and supports automatic relabeling.

ENGINEERING

The P & I Diagrams are turned into 3D models and adjusted to fit into their environment. IsoBuilder converts these 3D models to isometric drawings with labels and dimensions.

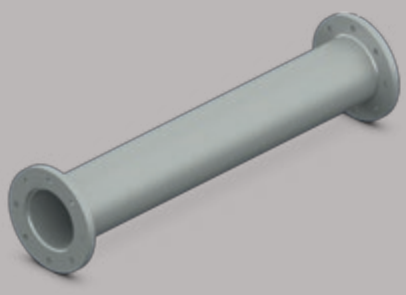


SPOOLING

IsoBuilder breaks the pipeline into spools based on your parameters and specifications, and generates all fabrication relevant data, such as CNC data, worksheets, part lists, cutting lists, welding documentation, etc.

TIG / MAG WELDING

An internal clamping system allows welding of t-pieces, elbows, reducers and weld-neck flanges, avoiding the need for air-gap and tack-welding. Even difficult materials such as Super-Duplex can be welded with ease.

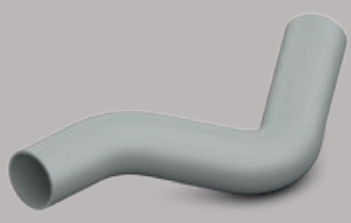


MAG WELDING

The inside and outside seams of two flanges at both ends of a pipe can be welded simultaneously. Our software calculates the rotation of the flanges for correct alignment of the flange holes after bending.

FLAME CUTTING

A flame cutter is capable of cutting bevels, as well as holes for branches, and matching saddle cuts. IsoBuilder generates all the required CNC data for these cuts.

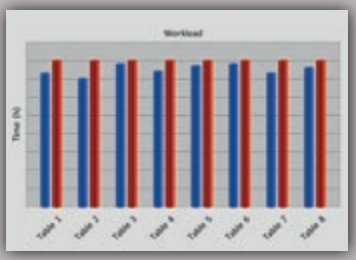


BENDING

Bending is often faster, cheaper, and more efficient than welding elbows. Kolli7 calculates all CNC data, compensating for material factors such as springback and stretching.

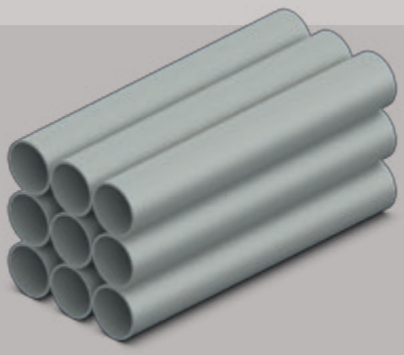
FIT-UP / WELDING

Our software provides customized worksheets that can be displayed on screens at the workstations, helping to achieve a paperless workshop, and enabling the operator to update the spool status live.



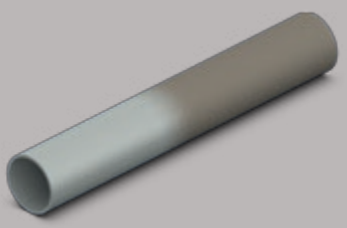
WORK PACKAGE

RAMP balances the workload for all machines and workstations based on material availability, machine capacities, scheduling requirements, and more. The capacity of all stations is used with optimal efficiency.



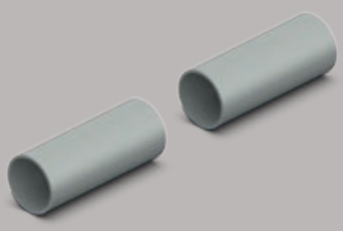
PIPE DISPENSER

Several hundred pipes are stored in a high-rise pipe dispenser, saving valuable floor space. Our software keeps track of each tray's loading status, ensuring that there is always enough material available.



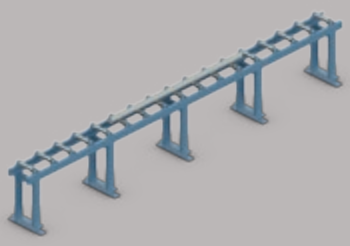
BLASTING

The pipe's surface is cleaned of rust and dirt, so that it is in optimal condition for cutting and welding. This automated process is fast and cheap, helping you avoid grinding and corrective work later on.



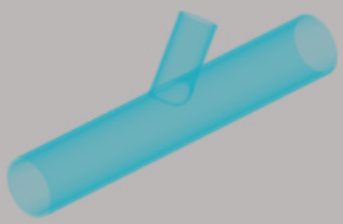
CUTTING

Our software calculates the exact cutting length of every pipe, factoring in stretching as a result of bending. Our optimization algorithm makes sure that the amount of scrap is kept to a minimum.



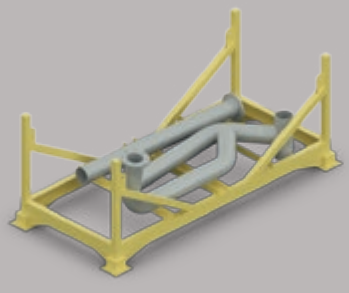
AUTOMATED TRANSPORT

A system of conveyors transports the pipes to the machines and workstations, minimizing the need for manual transfer and overhead cranes, and ensuring a clean flow of material.



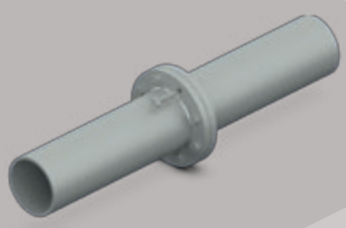
QC / TESTING

Our software tracks each spool and welding seam, and it can also prepare templates for quality control reports, and manage the rest results.



PRE-INSTALLATION

The finished spool is placed in a container that gets taken to the installation location. Our software determines the ideal sequence in which the spools should be installed, extending the clean workflow all the way to the end.



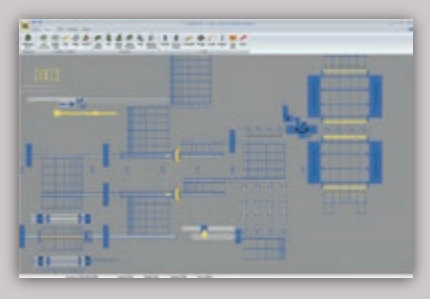
ASSEMBLY

Spools can be reported installed using our app for tablets and smartphones. The current status can be viewed in 3D. Information on every spool is stored in the central database, making repair jobs later on an easy task.

CONSULTING & PIPE-SHOP PLANNING

A modern tube shop is the foundation of efficient fabrication. With more than 40 years of experience in planning and design we have the know-how for your individual concepts.

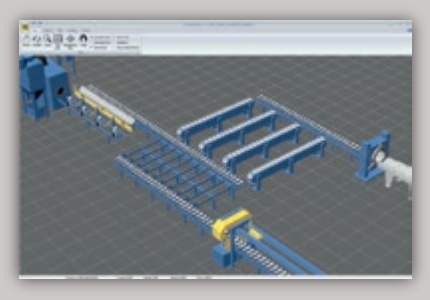
A modern tube shop is more than a collection of machines. It is an intricate combination of multiple factors, which all need to be considered to improve efficiency.



In order to fully optimize a workshop, the entire fabrication flow has to be analyzed and controlled. Any intervention at one point will have significant effects on other parts of the process. In order to help you avoid any of the many mistakes that can be made when planning a tube shop, we offer customized consulting services. These can help you build a workshop that will meet your fabrication goals while increasing your efficiency ratings.

As part of our consulting services we perform an in-depth analysis of your requirements, taking your current processes and machine park into consideration. We not only look at the flow of material in the shop, but also the flow of data and information. This way we can not only reduce the actual fabrication time, but also streamline your preparation process.
We can not only provide all fabrication relevant CNC-data, but also much of the information and documentation required for tracking and monitoring your fabrication.

So rather than offering you simply a collection of machines to put into your workshop, we offer you an integrated concept, combining software, machines and transport systems. Every component is carefully selected to work seamlessly with the others and to make optimal use of each component's full capacity.

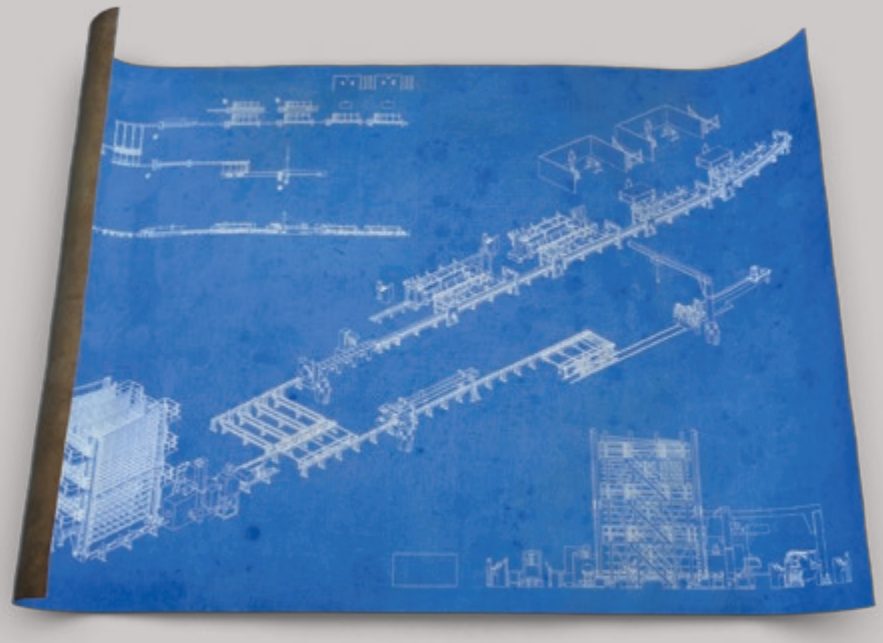


► Machines
Wherever possible we will retain your existing machines and integrate them into our concept. We will provide all CNC-data, making manual input by the operator unnecessary. Due to our close relationship with many manufacturers, we can integrate modifications to make the machines even more suited for your needs. The machines will be able to work continuously without idle times, since the combination of buffer storage and automated transport will provide a steady supply of material for each machine.

► Software
The software can be integrated into your existing IT structure, so you can import your tube models quickly and conveniently. All required reports, lists and worksheets can be created and filled out automatically. Work packages for fabrication can be created, with special attention to cutting optimization and retooling minimization.

► Transport System
A combination of plate-belts, roller conveyors, and cross-tables can supply all workstations with minimal waiting time. High-rise pipe dispensers can be used to store large quantities of tubes on a minimum of space. Buffer tables at the machines and workstations make efficient use of workshop space while preventing both bottlenecks and idle times.

- **► Analysis of Requirements**
- **► Evaluation of all Conditions**
- **► Cost Calculation**
- **► Machine Park Configuration**
- **► Tube-Shop Planning and Layout**
- **► Commissioning**
- **► Software System for Complete Process Control**
- **► Turnkey Delivery**



TURNKEY PIPE-SHOPS

Our fully customized pipe-shop solutions will boost your efficiency, regardless of whether your projects are ships, offshore rigs or industrial plants.

In order to remain competitive in a global market, it is essential to fabricate cost-efficiently without making sacrifices to quality. This means reducing fabrication costs and time as much as possible, as well as using modern machinery at maximum capacity.

In order to optimize efficiency, however, it is important to consider three interdependent aspects of the fabrication process:

► Data preparation – how is the data generated and transferred to the machines?

► Workflow and logistics – how does the material get to the machines in time?

► Machine capacities – are the machines in the shop the correct ones for the task?

Due to the complexity of this task, 3R solutions offers project planning and implementation for automated pipe-shop turnkey projects. With more than 35 years of experience and references around the world, 3R is a reliable and qualified partner for your pipe-shop improvement needs.

► Each pipe shop is unique. This is why it is important to have an individual concept for every project. Because of this, 3R solutions conducts an in-depth case study and analysis at the beginning of each project. This way it is possible to determine the optimal machines for each task, as well as the requirements in terms of storage and transport systems.

► Even if no turnkey project is required, the 3R analysis can still point out ways to improve fabrication, either by changing individual processes, or by integrating the software system.

► 3R solutions will coordinate the purchase, transport and commissioning of all transport systems and machines. Rather than having many different points of contacts, the customer only has to deal with one person from 3R, who will resolve all issues and challenges on site.

► Due to the close cooperation 3R solutions has with leading machine manufacturers, it is often possible to customize the machines in order to increase efficiency. These customizations can include physical changes to the machines (machine dimensions, locations of components), as well as changes to the data input, in order to integrate them fully into the pipe shop system.

► Every machine in the pipe shop is connected to the centralized database. The 3R software provides all required fabrication data in a format that the machine can process, so the operator only needs to confirm the data on his screen and initiate and supervise the machine process. After the spool has been processed at one machine, it is automatically transported to the next station in the process chain, while the status in the database is immediately updated.

► During the project the customer is fully involved and their input and ideas are always considered. In case a customer's idea can be implemented without disrupting other processes, 3R will be happy to do so. If a suggestion turns out not to be feasible, 3R will discuss this with the customer, in order to find a way to implement the suggestion in a way that can be realized.

► In-Depth Analysis

► Individual Concept

► Machines from Leading Manufacturers

► High Degree of Automation

► Integrated Software

► Warehouse Interface

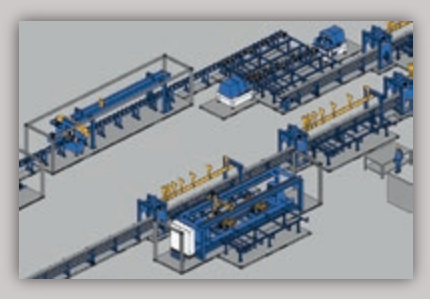
► Automated Transport of Material

► Post-Processing Analyis of Projects

MODULAR PIPE-SHOPS

Our modular pipe-shop solutions enable you to realize temporary installations, combining quick setup, high flexibility, and easy dismantling with a high grade of automation.

Besides our turnkey solutions for fixed pipe-shop installations, including automated storage, logistics and processing machines, 3R also develops modular pipe-shop solutions for temporary installations. These modules are designed for convenient transport to the installation site, quick setup and commissioning, and easy dismantling after the end of the specific project.

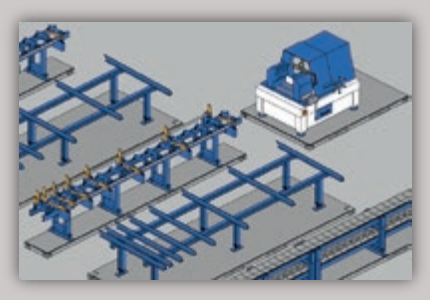


The flexibility of the system allows operators to combine various components with high flexibility, based on the specific requirements of the tasks at hand, while retaining the efficiency of the customized pipe-shops that 3R is renowned for.

All components will either fit into a standard freight container or upon a regular flat-bed trailer, so they can be moved directly to their operating position without any extensive setup or assembly process.

- **► Quick Setup & Dismantling**
- **► Flexible Layout**
- **► Easy Transport to next Project Location**
- **► Pre-Mounted Components**
- **► Software Automation**
- **► CNC Data Generation**
- **► Fabrication Tracking**

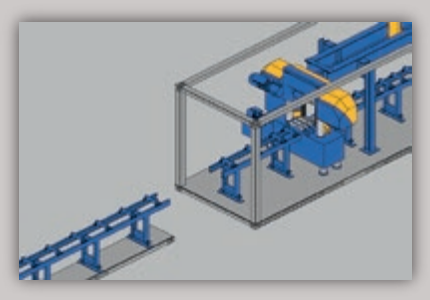
The entire shop is controlled by a sophisticated automation system which receives its data from the 3R software suite.



► The modular pipe dispenser allows for first-in, first-out storage of pipes of multiple diameters and wall thicknesses in the same system, while remaining movable on a flat-bed trailer. The system includes loading and unloading lifts, for automated removal of the requested pipe.

► The automated shot-blasting machine can be broken down into two parts, both of which easily fit into a standard freight container. For installation the two pieces are combined, allowing efficient cleaning of pipes from scale, rust, dirt and other impurities, in order to facilitate and improve fabrication quality.

► The high-powered band-saw with attached measuring track and length arrestor cuts pipes that have been delivered from the pipe dispenser. The centralized clamping, cutting control system and micro-spray lubrication allow for clean and fast cutting of pipes, while the integrated roller conveyor moves the pipe to the next location.

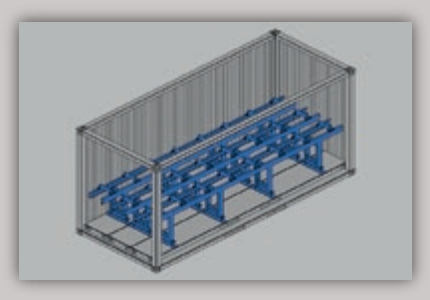


► The combination TIG/MAG welding machine uses a sophisticated internal clamping system in order to allow for welding pipes without the need for tack-welding.

An integrated welding control system constantly monitors all parameters and settings, while an optional camera system allows the operator to supervise the welding process directly from the control panel.

► The modular roller conveyor system is used to move pipes fast and safely to the next processing unit. By combining multiple conveyor modules a pipe with a minimum length of 800 mm can be moved at a speed of approx. 30 m/min. Conveyor systems for shorter minimum lengths are available upon request.

► The buffer tables on the other hand are used to assure that machine operators have a constant flow of material for processing.
While the regular version serves as a final destination for manual removal (e.g. for rest pieces or at welding/fit-up stations), the version with separator allows for transfer of individual pipes from the table to the next processing station or roller conveyor.



► The data generated by our software suite includes not only baseline data for each spool, such as diameter, wall-thickness and an internal tracking number, but also routing information and CNC data.

Assembly work on site can be accomplished without the need for any welding. All parts are designed to be connected by screws, enabling you to dismantle everything once the current job is finished, and put it back together at the site of the next project.
All electric wiring is included in the mount plates, making channels in the ground unnecessary. Depending on the extent of the project, the pipe dispenser may require a foundation.

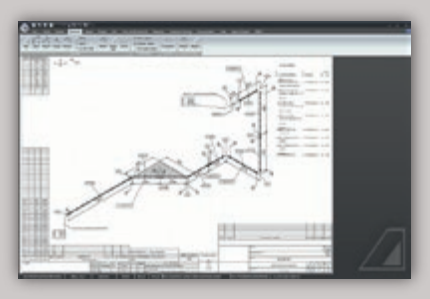
ISO BUILDER

IsoBuilder is an intelligent solution for the import and editing of isometries, which extracts all fabrication relevant data from the drawing.

With each isometry IsoBuilder provides the basis for all following calculations.

Due to an integrative database all fabrication relevant information regarding the pipeline elements are known. Therefore the system can use the drawing to automatically generate all required information and lists, which are required for purchasing and the fabrication of the order. Besides the creation of parts and welding lists this also includes tube-shop appropriate preparation of CNC-data.

By conducting a logic test the integrity of each isometry can be examined, and errors can be discovered early.



► Features and Expandability
IsoBuilder supports a large number of interfaces to the common construction and coordination systems, and can thus be integrated into an existing environment without problem. The interfaces are constantly expanded and in part adapted to individual requirements.

Each drawing is split into individual tubes (spools) according to customizable criteria.

Examples would be double-flanged connections, assembly seams, or valves. Maximum size or weight is taken into consideration as well. For each individual tube a worksheet for fabrication is generated.

The automatic splitting of a drawing into separate spools can be customized to suit the customer's needs.
At the push of a button it is possible early on to calculate and document the time and costs to fabricate and install the spools. In order to improve legibility on the worksheet the connections can be displayed in a non-scaled fashion.

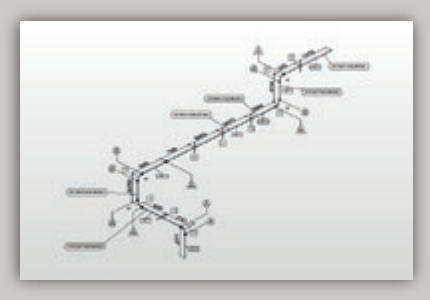
► Interfaces
For the import or export of isometry data from third-party systems, interfaces with many formats are available:

- ► Tribon
- ► Unigraphics
- ► Nupas Cadmatic
- ► CATIA
- ► ProEngineer
- ► ShipConstructor
- ► Intergraph
- ► PDMS
- ► IGES
- ► PCF
- ► IDF

Additional interfaces can be realized upon request.

► IsoBuilder in Combination with RAMP
IsoBuilder splits a drawing into its spools based on a set of rules defined by the customer. For each isometry all information relevant for fabrication is then generated and stored in the database. By combining the system with RAMP it is possible to access these values to generate CNC-data for all stations of the manufacturing process (saw, flame-cutting machine, bending machine, etc.).

► Calculation of Production Time and Costs
In order to be able to estimate the production time and costs of a drawing IsoBuilder can generate corresponding lists at the design stage.



► Modification Management
RAMP updates the status of the individual pipe, as soon as a station of the fabrication process has been passed.
If a drawing was changed retroactively by the construction department, IsoBuilder can align the effected modification with the fabrication progress.
The user can respond to each modification individually. This minimizes investment for revisions and maximizes transparency. In addition IsoBuilder documents the time expense required for modifications.

► Dia Inch Reports
The Dia Inch report provides a detailed overview of the fabrication expenditure for each drawing. To do so all shop and field welds and threaded joints receive a factor based on their nominal size and the connected element. The various connections are then listed and grouped by their factor. By looking at the sum of all factors, it is possible to gauge the complexity of a spool.

► Worksheet and Logic Test
IsoBuilder offers a logic test, which determines whether the individual components of the drawing can be fabricated. Afterwards IsoBuilder can generate worksheets, part lists, welding documentation, bending / cutting lists and many other documentation for each individual spool, which include all information required for fabrication at the various tube-shop stations.

- **► Creation of Isometric Drawings**
- **► Integrated Element Database**
- **► Numerous Interfaces to common 3rd Party Systems**
- **► Automatic Spool Splitting**
- **► Automatic Calculation of Production Time and Costs**
- **► Generation of Detailed Processing Data and Lists**

PIPESHOP EXAMPLE

This very basic layout of a pipe-shop demonstrates the basic principles of setting up an initial pipe-shop concept, which will be further refined in cooperation with you, our customer. However, even a good layout requires sophisticated software in order to realize its full potential. We at 3R offer you both software and hardware, allowing you to maximize your efficiency.

At every machine and workstation there is a PC terminal that is directly connected to the central database, in which all fabrication information regarding pipes and fittings is stored. Regardless of whether your projects are ships, offshore rigs or industrial plants, the fabrication status of every spool is updated in real time, giving you current data at all times regarding your progress and output numbers.

SLIP-ON FLANGE WELDER

Saving time and money is easy when you can take care of four welding seams at the same time. This machine has four welding guns, making it possible to simultaneously weld the inner and outer seams of two flanges. Flanges will always be plane parallel and rotated correctly.

V-GROOVE WELDER

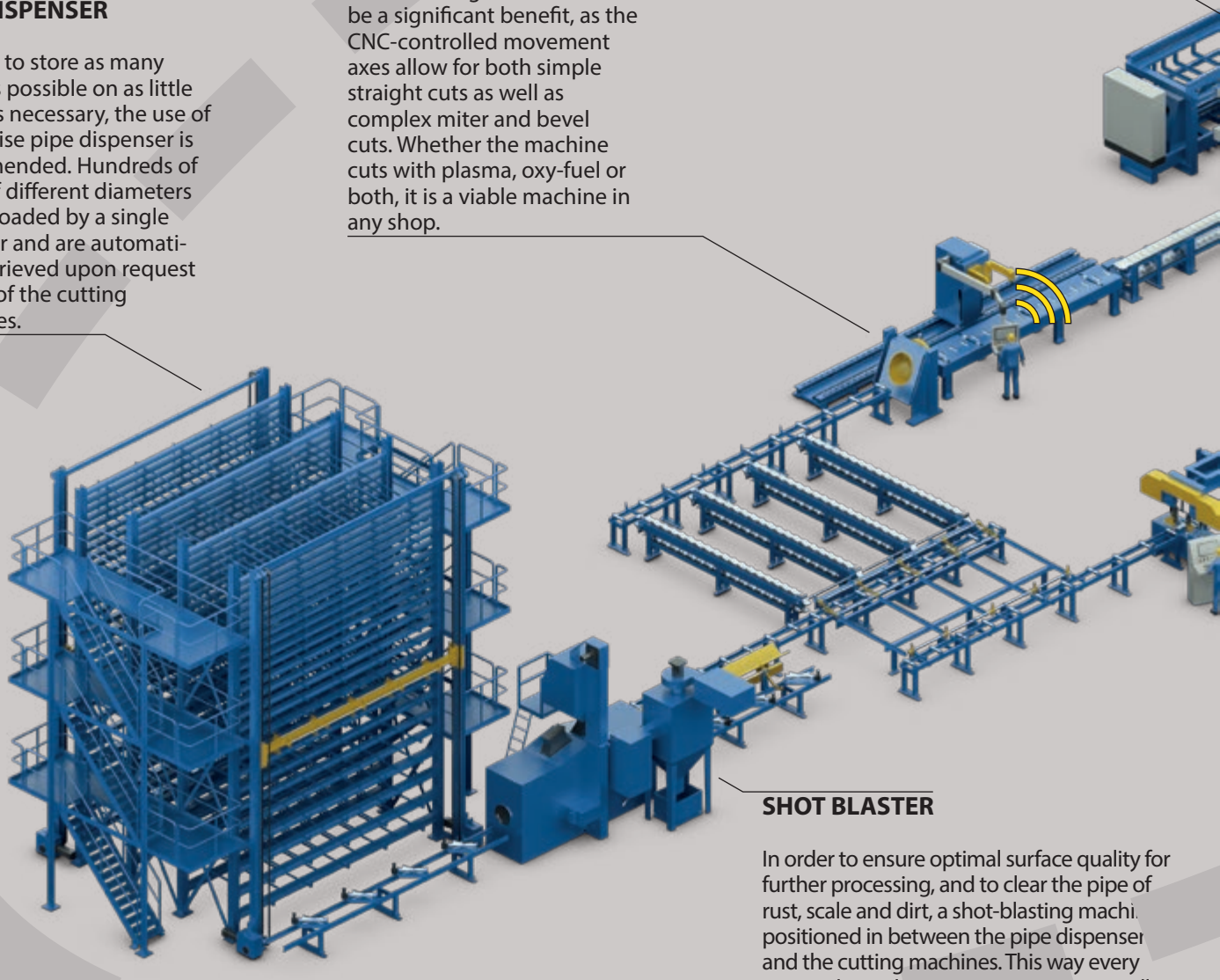
This versatile machine is capable of welding different kinds of fittings to pipes. It is possible to weld neck-weld flanges, elbows, t-pieces, or reducers without any need for tack-welding, thanks to an innovative internal clamping system that keeps the fittings and pipes in position.

FLAME CUTTER

For pipes that require welding seam preparation (V-bevels), saddle cuts or holes for branches, a flame-cutting machine can be a significant benefit, as the CNC-controlled movement axes allow for both simple straight cuts as well as complex miter and bevel cuts. Whether the machine cuts with plasma, oxy-fuel or both, it is a viable machine in any shop.

PIPE DISPENSER

In order to store as many pipes as possible on as little space as necessary, the use of a high-rise pipe dispenser is recommended. Hundreds of pipes of different diameters can be loaded by a single operator and are automatically retrieved upon request by one of the cutting machines.

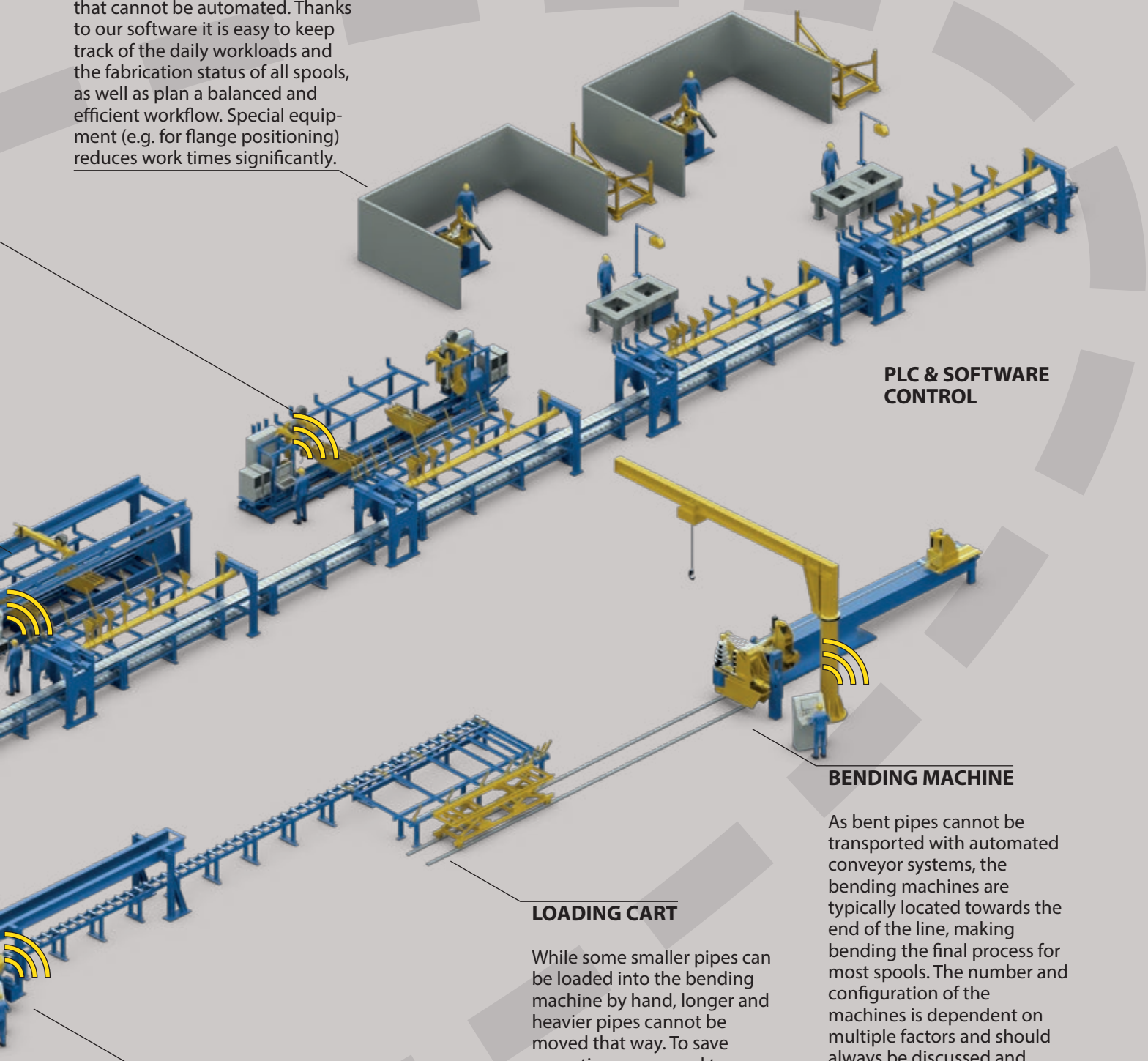


SHOT BLASTER

In order to ensure optimal surface quality for further processing, and to clear the pipe of rust, scale and dirt, a shot-blasting machi positioned in between the pipe dispense and the cutting machines. This way every pipe is cleaned prior to processing, regardless of the time it spent in the dispenser and what processing steps are planned.

MANUAL WORKSTATION

There will always be work steps that cannot be automated. Thanks to our software it is easy to keep track of the daily workloads and the fabrication status of all spools, as well as plan a balanced and efficient workflow. Special equipment (e.g. for flange positioning) reduces work times significantly.



PLC & SOFTWARE CONTROL

BENDING MACHINE

As bent pipes cannot be transported with automated conveyor systems, the bending machines are typically located towards the end of the line, making bending the final process for most spools. The number and configuration of the machines is dependent on multiple factors and should always be discussed and evaluated prior to purchasing a machine.

LOADING CART

While some smaller pipes can be loaded into the bending machine by hand, longer and heavier pipes cannot be moved that way. To save some time compared to using a crane, a height-adjustable loading cart is ideal, as it can be used to move the pipe to the precise position needed to load it into the machine.

BAND SAW

This high-powered band-saw ensures precise, clean and even cuts. In order to avoid manual measuring and marking (which is both time consuming and inaccurate) a measuring track with length arrestor is added, significantly reducing cycle times. For high-volume fabrication multiple band-saws may be required.

CENTRAL DATABASE

The central database is connected to every machine and workstation throughout the pipe shop. Information is constantly transferred to and from the database.

SPOOL EDITOR

A streamlined tool for generating fabrication data quickly and efficiently from external construction systems.

SpoolEditor is a user-friendly alternative for generating fabrication data for pipeshops. Existing worksheets and spool information can be applied easily by existing import-interfaces. All cutting lengths, CNC bending and flame cutting data, welding information and bills of material will be created automatically and stored in your fabrication database. The efforts for processing a spool for work preparation have been minimized.

► Integration into the 3R Software Framework
SpoolEditor improves the framework by a solution for connecting external construction systems and RAMP. Almost all construction systems are able to provide a worksheet (PDF) and ideally a drawing (PCF/IDF) for every spool. SpoolEditor is utilized to check the worksheet and the imported data for integrity and to complete any missing information before sending the spool to fabrication.

- **► Catalogues for Customer-Dependent Material Storages**
- **► Automatic Generation of CNC Flame Cutting Data**
- **► Supported Interface to the Pipe Bending Simulation Kolli7**
- **► Extended Welding Information**
- **► Customizable User Administration**

If the worksheet comes without any importable drawing, all data can also be typed in manually. This way all data required by the pipe-shop can be created without any use of a construction system.

SpoolEditor has very slim and convenient material management. The entire material can be maintained within one Excel table, which can be imported into the system. All materials are stored in the RAMP database, making it unnecessary to administrate a second database.

Unlike IsoBuilder, SpoolEditor is not a construction system. The core functionality is to supply the RAMP database with spool fabrication data.
SpoolEditor is the perfect choice for all customers who have already completed the spool design and want to transmit the design to their pipe-shop as easily as possible.

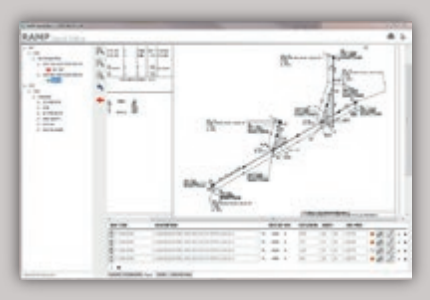
► Easy to learn
The goal of SpoolEditor was to create a slim and specialized piping solution between the design and the pipe-shop. SpoolEditor has a comprehensible user interface which can be mastered within a few hours. Time-consuming training phases are not required.

► Material Catalogues
If required by the customer, each project can have its own material catalogue. This can avoid possible conflicts between the material identifiers, and prevents merging all material into a single catalogue.

► CNC Flame Cutting Data
The generation of CNC flame cutting data is done automatically when importing a drawing. For manually added pipes SpoolEditor offers various visual templates for typing in the required parameters.

► Interface to the Pipe Bending Simulation
SpoolEditor has an integrated interface to the pipe bending simulation Kolli7, in order to detect and avoid potential conflicts during the bending process by an early fabrication analysis.

► Extended Welding Information
Every welding seam can be extended by additional parameters:
Defining non-destructive testing
Dia Inch parameters to estimate the welding efforts
Welding the seam manually or at an automated welding station



► Customizable User Administration
SpoolEditor allows for administrating own user roles with particular access rights based on the available software features. The rights to create, validate or fabricate spools as well as the maintenance of material and many other abilities can be individually assigned to the designed roles.

RAMP

Automation and optimization of tube production with intelligent software. Increase your tube shop's efficiency from construction to assembly.

RAMP is the 3R software framework's core application package for tube-shop automation. It is composed of a central system and any number of client modules, spread throughout the tube shop (at the storage rack, the saws, the flame-cutting machine, etc.).
RAMP receives all relevant material, drawing and fabrication data from IsoBuilder or interfaces to alternative isometric drawing software.
The primary goal of RAMP is to balance the flow of material and the utilization of the various machine and welding stations, and to control the entire flow of material.

► Production Control
The fabrication status assigned to a component by the RAMP-system can be checked retroactively in IsoBuilder. This way the up-to-date progress in the tube shop for finished isometries can be determined at any time.

► Calculation of Work Time
In the RAMP master file a time value, contigent on the material, is assigned to each work step, and the various stations know the appropriate maximum use of capacity. This way bottlenecks at individual stations in fabrication can automatically be detected and avoided early.

► Individual Workshop Control
Each installation of RAMP is customized to cater for our customers' individual requirements, as every workshop holds different storage options, machines and transport systems. Furthermore every fabrication process needs to address different key aspects.

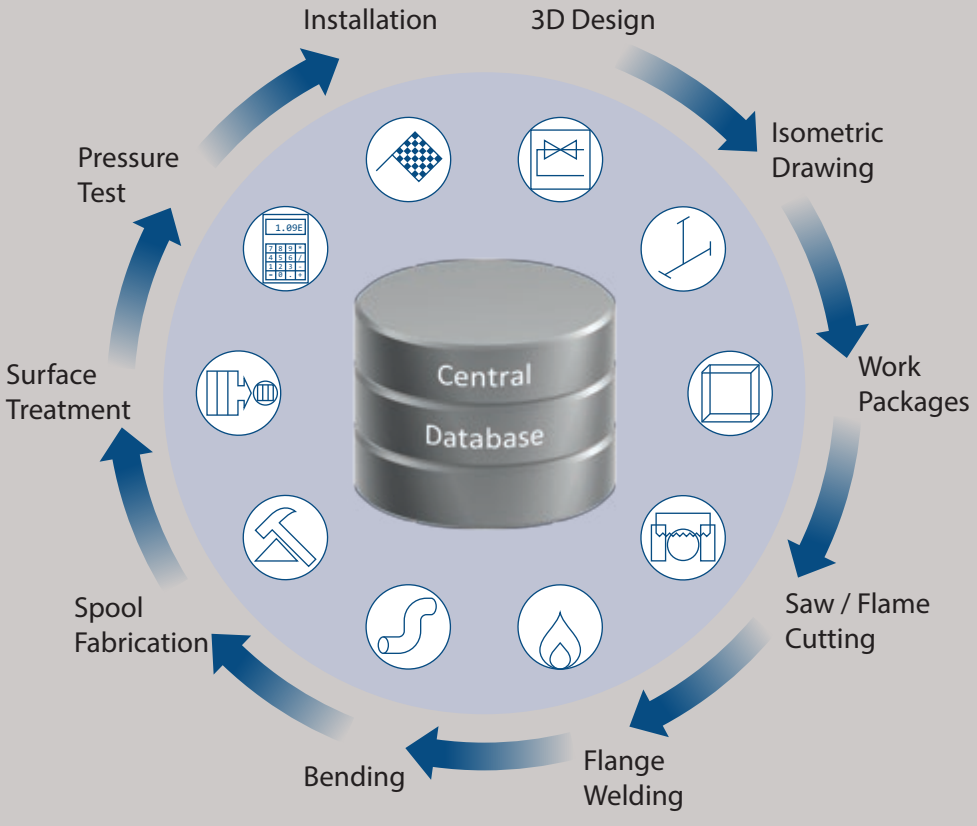
► Material Calculation and Documentation
For RAMP each drawing (e.g. from IsoBuilder) contains not only the displayed drawing, but all fabrication relevant contents, such as welding points, bending values, tube lengths, spool weight, as well as all installed materials. The entire order process, allocation of material, the welding documentation, as well as following material statistics can be realized by RAMP.

► Work Preparation
The entire work preparation process is facilitated by RAMP. By using various filter and sorting criteria the user can create optimized packages for fabrication in the tube-shop. These packages always take maximum use of capacity of individual machines and stations into consideration, as well as current availability of material.

► Modification Management
In practice modifications of drawings are a daily occurence. Because of the modular method of operation of the RAMP system it is possible to stop modification relevant isometries directly and automatically at the current fabrication process, until the planning engineer has decided the extent to which the modifications impact already completed components. RAMP recognizes modified parts of drawings, and provided the user with a detailed display of all modifications.

► Machine Control
Every CNC machine can be equipped with a RAMP-Client. This way CNC data can be transferred directly to the machine, and after the relevant fabrication step is executed, the status of the component can be updated. Afterwards the software specifies the next operation, and the tube spool is transported to the next station if required. Fabrication at each workstation can thus be reduced to a simple push of a button.

► Monitoring of Dates & Progress
By connecting the various work stations to a centralized fabrication database, and recording the appropriate status of each processing step, the current progress of fabrication can be checked at any time.



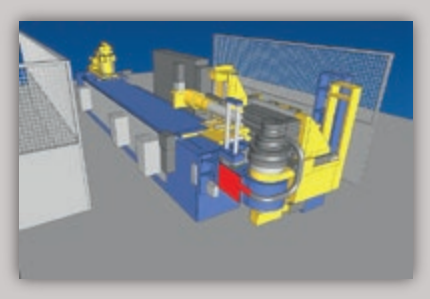
- **► Tube-Shop Control**
- **► Monitoring of Progress and Dates**
- **► Calculation of Work Time**
- **► Calculation of Capacities**
- **► Paperless Tube Processing**
- **► Material Calculation / Statistics**
- **► Cutting Optimization**

KOLLI7

Kolli7 is an automated feasibility analysis for tubes and profiles that are processed on CNC bending machines. It is the result of 30 years of continuous improvement and refinement.

With the Kolli7 software framework 3R offers not only a computerized feasibility analysis with generation of CNC data, but also a construction platform for tube geometries, for processing on modern tube bending machines.
For precise monitoring and support of the fabrication process the entire bending operation is simulated and tested for collisions.

Kolli7 supports both simple mandrel bending machines as well as modern right- and left-bending machines with multiple bending heads and levels. In addition to standard mandrel bending with bending die Kolli7 also simulates roller and induction bending.



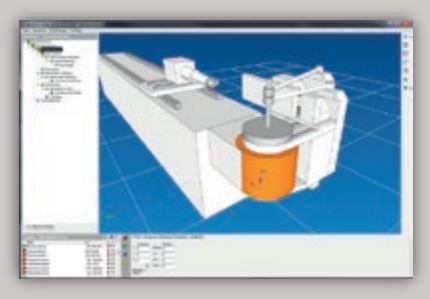
► Simulation
Kolli7 simulates the bending process of a tube geometry on one or more virtual bending machines. In case of interference or collision during the bending sequence the software independently searches for solutions. In addition the user can intervene manually at any time and adjust the bending process. The search for a suitable bending sequence is dependent on the machine type.

The more complex the bending machine is (e.g. right / left bending machines with multiple heads and levels), the more options are taken into account for testing.

Among others, the following possibilities are tested:

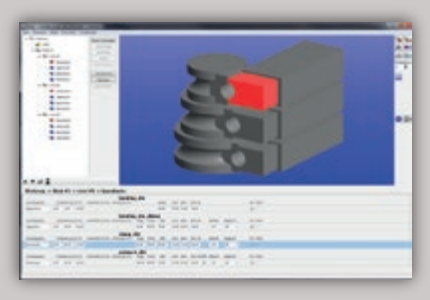
- ► Changing the rotation direction
- ► Adding a correction feed
- ► Changing the bending direction
- ► Changing the bending head
- ► Changing the bending level
- ► Changing the bending sequence (machine-type dependent)

► Machine Editor and Tool Editor
With the Machine Editor users can easily create a virtual model of their machine and its environment.
The Tool Editor creates a virtual image of the bending tools, which is used with the model of the bending machine in the simulation.



► Material Manager
The Material Manager administers the material-specific properties of the tubes, bars and profiles. Especially in unit production of tubes it is essential to achieve a precise bending result on first try.
Using the Material Manager empirically derived data can be collected and recorded easily. The recorded information serves the fitting accuracy of the pipelines to be bent, and the generation of CNC data.

► Generation of CNC Data
Kolli7 considers all relevant machine-, tool-, and material-specific parameters when generating CNC-data. Kolli7 calculates the precise cutting length, considering the tube's springback, the reduction in traction lengths caused by overbending and the bend's radius increase, as well as the material stretching inside the bend.



► Cycle Times
For each tube geometry Kolli7 determines a machine-dependent theoretical cycle time. This way the speed and efficiency of several machines can be compared directly.

► Interfaces
A continuously growing number of interfaces enables the import and export of data. These interfaces allow the control of CNC bending machines as well as the import of tube geometries from third-party systems, like measuring systems or CAD-platforms.

► Automatic Testing of Multiple Pipelines on Different Machines
The Kolli7 framework can automatically test a large number of pipes on different machines and tool combinations. For every pipe Kolli7 automatically finds the right machine and tool. The entire simulation of all pipelines can be evaluated statistically.

► Bending with Flanges
Some bending machines are capable of bending pipes with flanges. Depending on the clamping device Kolli7 calculates the relative rotation of the flanges against each other (flange welding machine) as well as the rotation before the first bend in order to ensure the correct position of the first flange after bending has been completed.

- **► Collision Detection**
- **► Multiple Bending Heads and Levels**
- **► Mandrel and Roller Bending Machines**
- **► Generation of CNC Data and Transfer to the Machines**
- **► Import from 3rd Party CAD Systems**
- **► Automatic Correction with Measuring Systems**
- **► Bending with Flanges**

FREEFORM MANAGER

FreeformManager offers automated generation and correction of CNC-data, as well as a feasibility analysis for freeform tubes on CNC bending machines.

FreeformManager builds on the years of experience of creating and refining our bending simulation Kolli7, and extends the core principles to work for tubes that are bent with a continuously changing bending radius. It is the world's first software for the calculation and simulation of such freeform bends.

While Kolli7 is also capable of simulating bending processes on roller bending machines, it only considers one fixed radius per bend.
FreeformManager, on the other hand, was specifically designed to deal with bending radiuses that are varying throughout the entire bending process, enabling you to utilize the full potential of your roller bending machine.

Even though the task may not sound very different, a radically new approach was needed to succeed in calculating and simulating true freeform bending. That and the additional new requirements that had to be fulfilled meant that FreeformManager was designed as a completely new standalone software, rather than being integrated into Kolli7.

Right after it was finished, the brand new FreeformManager was put to the test in a project in Saudi Arabia, which it passed with flying colors.

► Simulation
Just like its sibling program Kolli7, FreeformManager simulates the bending process on one or more virtual bending machines.

It detects any potential collision between the tube and the machine or itself, and automatically alters the process in such a way that the optimal bending sequence is found, in order for the tube to be bent without any collision, provided of course that the tube actually can be bent.

► IGES Import of Spline Curves
Construction data of a tube can be imported from a CAD-system for further processing by using an interface to the IGES file format.

► Manual Creation of Curve Progressions
Besides the import of curve progressions from CAD-systems, an integrated editor allows the creation and editing of a tube by using the parameterized input of tube segments.

► Support of Combination Tools
The application can also generate CNC data for fixed radius bends, which are created using one or more bending dies. A machine with a combination tool can fabricate tubes with freeform and fixed radii in one process. The required data for the tool change from the freeform tool to the bending die are automagically generated by FreeformManager. The required tooling for the fixed and the freeform radius is automatically recognized.

► Set-Actual Comparison and Correction of CNC Data
FreeformManager considers all important machine-, material-, and tool-specific parameters when generation CNC-data. The software offers interfaces to measurement systems, so that their data can be compared with the set-tube. The result is displayed as a deviation report and is used for the automatic correction of the CNC-data. Generally the tube is in the tolerance range after the first correction, but the corrected bending product can be continuously corrected as many times as desired.
The result will approximate the set-tube more and more with each iteration.

► Feasibility Analysis & 3D Simulation
The fabrication process for a freeform tube can be displayed as an offline simulation of the machine's axis movements. During the simulation FreeformManager checks the geometry for collisions with the machine. In case of collision the software will search for alternative axis movements to manufacture the tube collision-free.

► Management and Automated Adjustment of Radius Tables
Especially for single unit production it is important to get an exact result on the first try. Empirical data can be collected easily for later use for tube correction. Due to the set-target comparison of similar tubes, FreeformManager can adjust radius tables in a self-learning way.

► Collision Detection

► Multiple Bending Heads and Levels

► Support of Mandrel and Roller Bending Machines

► Generation of CNC Data and Transfer to the Machines

► Import from 3rd party CAD Systems

► Automatic Correction with the Help of Measuring Systems

MOBILE SOLUTIONS

High flexibility and mobility are standards that can be reached when creating isometric drawings as well. Discover Draftboard as a smart and complete solution.

An isometric drawing is created by a designer in a dedicated construction office or department. The required software is often very expensive. Drawings are frequently created as paper sketches on site, to be transferred into the system manually afterwards.

In times of portable and compact computers we introduce a modern solution, to sketch isometric drawings and then transfer them into the construction database at the push of a button.
Draftboard not only serves as a mobile addition, however. It can also be used as a cost-effective and independent system for the creation of isometric drawings at the PC.

► Drawing Isometrics
Isometric drawings created with Draftboard are generally drawn without scale. Pre-selected bends, branches or flanges can already be set during the creation of the drawing. The lengths of the drawn connections are defined afterwards. The user interface is convenient for the use of Draftboard as a mobile isometric system.
Using a tablet PC any isometric drawing can easily be created with a pen. The integrated input assistance features allow the user to work without having to use a keyboard.

Users can place their own customized elements, lugs, auxiliary marks, spool or welding symbols, define their individual title block, or align the isometric drawing with reference planes. With the wide range of functions of Draftboard users can define almost any isometric drawing completely. The intuitive user interface and clearly laid out tools and menus make it easy to learn and operate as well.

► Drawing with Draftboard
The isometric drawing is sketched either with the mouse or a pen (tablet). The context mode recognizes which object was selected by the user, and decides which action to perform based on the input. This way a multitude of functions can be accessed and executed by a simple click. Each function is also accessible on a menu bar.
All element symbols that are placed can be freely defined and drawn with an included editor. Symbols for welding, components or text can be placed freely on the drawing as well.

► Title Block Editor
Draftboard includes an integrated editor to design and edit a customized title block. Here the frame and layout are determined, while all used content is defined by using place holders.
The title blocks are saved as files, and can be loaded into Draftboard immediately.

► Symbol Editor
The symbol editor allows for the creation of customized 2D element symbols. Among others this includes customized flanges, valves, fittings, reductions, etc. Each element is clearly defined by its symbol name. The number of connection points can be chosen freely, and symbols are drawn with points, lines and polygons.

If Draftboard is used to supplement IsoBuilder, the geometrical class of the elements can be defined in the symbols. IsoBuilder uses this class to recognize which category of components the element belongs to.

► Mobile Application
Our mobile solutions application for iOS and Android enables you to access fabrication information on the go. At the beginning of the fabrication process all elements are marked with a unique barcode, which links them directly to the information stored in our RAMP system. This minimizes the effort for the user to get the specific information on any given element and increases the monitoring abilities in the fabrication process.

- **► Drawing without Scale**
- **► Customized Symbol Palette**
- **► Customized Title Blocks**
- **► Reference Planes**
- **► Logic Test**
- **► DXF Export**
- **► 3D View**
- **► Suitable for Tablets**
- **► Monitoring App for iOS and Android**

TUBE FIT

Modern measuring systems increase precision in tube prefabrication, and facilitate the collection of bending data for improving quality assurance.

TubeFit is a cost-efficient tool for the measuring of tubes. A fitting tube, including flange displacement, can be measured within minutes. The derived data is transfered directly to the 3R software framework, in order to prepare fabrication.

Kolli7 processes the measuring data and corrects the bending values, in order to compensate for material traits (e.g. springback, stretching, traction reductions).

Due to its intuitive user interface TubeFit requires very little training time.

► CAM with TubeFit
With TubeFit the precise coordinates of a bent tube can be recorded. This way the material properties of a tube type can be determined in order to achieve perfect results with future bending operations.

In addition TubeFit supports the fabrication of fitting tubes. With a few measuring points connected flanges can be measured. If desired the hole position can be recorded as well. Predefined flanges can be stored as required.

► Individual Workshop Control
The expansion of the 3R software framework with the CAM system TubeFit allows for precise recording of a tube or tube model within a few minutes, by using a measuring arm. Of course all recorded data can be processed further within the framework.

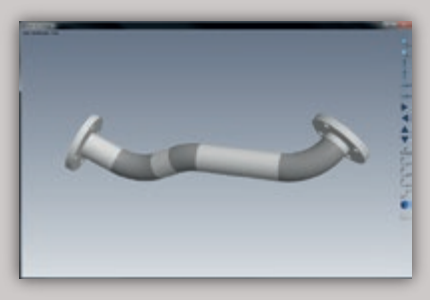
► Measuring Arm
The measuring arm is placed at a fixed position, in order to define a reference point for the measurements. The measuring tip at the end of the arm can be moved freely in space. Using a USB connection the relative coordinates of the tip are transmitted to the software at all times, and can be recorded as measuring points with a hand or foot switch. If parts of the tube or basket models are out of the range of the measuring tip the measuring arm can be moved during the measuring process with minimal effort by defining a reference system.

► Simple Operation
TubeFit guides the user through the entire measuring process step by step, and shows which measuring point are to be recorded next.
Recorded data can be viewed freely in the graphical 3D user interface, which serves as comparison between the original and the digital model. Any step of the process can be undone if necessary.

► Fitting Tube Measuring
A basket model can be measured by defining connection points and entering a projected path for the tube. For connection points flanges, grooves or sleeves can be selected and recorded with just a few surface measurements.

► Calculation of Correction Values
Optimal bending results for prefabrication can be achieved by recording correction values using a prototype. This data can be transferred to Kolli7, where the CNC data is recalculated under consideration of deviations.

► Branches
It is possible to add branches to a model. This makes it possible to measure fitting tubes with more than one connection point.



► Convenient Measuring of Fitting Pipes

► Checking and Correction of Bending Data

► High-Precision Data Recording

► Easy Operation

► Increased Range through Reference System

INDIVIDUAL SOLUTIONS

When standard software reaches its limits, development has to be adapted to meet the customer's requirements.

In recent years more and more companies all over the world have focussed on computerized support of tube fabrication. This not only increased efficiency, but also improved the quality of tube processing. Using several systems, however, also requires precise coordination of all involved components.

The communication and interaction between the systems and departments occurs via various interfaces, which must be able to transfer all data without loss or corruption. For special requirements, however, generic standard software often does not provide appropriate solutions anymore. At this point the use of specialized software becomes more and more important, in order to bridge the gap between systems, and meet the particular requirements of the customer.

► Customized Software
Close cooperation with our customers is indispensable for us. Concepts and solutions are developed jointly and are adapted specifically to meet requirements. Thanks to this continuous communication, the development process is constantly examined and improved.

A high degree of flexibility and short turnaround times are just some of our characteristics. Entire fabrication processes can be automated by using software that was specifically designed and adjusted for this task.

Daily work processes can be optimized, and opportunities to implement innovative ideas can be realized.

Instead of adjusting processes to fit the software, the software is designed to optimally support existing capabilities and methods, which will be maintained and adapted wherever possible.

► Management System for Operational Processes
For several years a customer has used a customized management system, based on operational requirements. This management system controls the internal processes of a tube processing business.

Due to constant development of the software, this system evolved into a complex enterprise resource planning (ERP) system. All contracts are recorded in the system. All documents that are relevant for order processing (order and shipping documents, etc.) are generated automatically. At the same time both customers and suppliers are managed by the database.

By now scheduling, planning and manufacturing control are carried out with this system, which at this point is used by more than 50 simultaneous users at multiple locations.

By management of the quality characteristics of a finished unit it is possible to determine whether a contract is completed, and to generate a documentation of the fabrication process.

► RAMP
The modular RAMP system is a complete solution for process engineering and pipe-shop control.
Each pipe-shop is unique. Differences can clearly be determined by looking at the utilized machines, data processing and mode of operation. Thus RAMP has to be adjusted for each individual customer, or be developed specifically according to a predetermined concept.

Using RAMP optimizes the productivity of the shop and automates processes wherever possible.

► New Fields of Application
By now we offer software solutions beyond the area of tube processing. An extensive management system for a major company with multiple networked locations has been maintained and continuously developed for several years now. The most recent addition was an application for the monitoring and coordination of pressure and loading tables for coke ovens, and the automatic heating of their batteries, which was put into operation in 2012.

► CNC Bending Machine Control
Interfaces to SPS-controls are part of the application range for customized software solutions as well. An example for this is the integration of a versatile and intuitive interface between Kolli7 and the bending machines of a machine manufacturer.

- **► Extensive Management System for Operational Processes**
- **► Computer-Supported Control of Tube Workshops**
- **► Numerous Interfaces to Market-Leading CAD-Systems**
- **► Complete Control System for CNC Bending Machines**

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- CIG Piping Technology
- COMCO
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- DEUTZ®
- DYNOBEND
- EvoBus
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- GENTING
- HEISCO
- HERBER
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- Hyflux®
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- Keppel FELS
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- Keppel Singmarine
- KHS
- KOBAU Gruppe
- Lamprell
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- LIEBHERR
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- MAN
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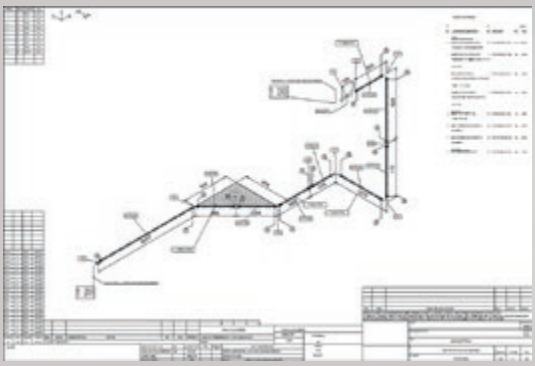
- VARD® a Fincantieri company
- VOSWINKEL
- VW
- WWV Wärmeverwertung



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