

# IDEAS

Simulation solutions for pulp and paper



# **The challenge:** To reduce the risk to your people, your equipment—and your investment



## **The solution: Measure. Simulate. And profit.**

**In every industry, in every business, there is risk—to your people, your equipment, and your investment. Setting your operation free of these risks is what IDEAS is all about. IDEAS is the world's leading dynamic simulator for kraft pulp mills. In**

**fact, 80% of new pulp mill start-ups utilize the IDEAS simulator. Why? Because it works—helping mills worldwide to save time, money, and resources.**

IDEAS is more than just a cutting-edge simulation tool. It is supported by a team of development engineers and process experts

who have years of hands-on experience at pulp and paper mills around the world. We bring the power of IDEAS right to your site, no matter where it is in the world. Our global, industry-specific experience means we understand your issues and can provide you with solutions efficiently.

IDEAS provides solutions for three key areas of project development.

**Process design**

IDEAS enables you to test and verify design concepts and process control logic—quickly, and at low cost and low risk.

**Control logic (DCS) verification**

IDEAS is an excellent tool for staging, testing, and validating control logic—identifying and correcting errors to help you achieve a faster and smoother start-up.

**Operator training**

IDEAS works much the same way as a flight simulator, providing your operators with realistic, hands-on training modules—reducing the risk to both themselves and your equipment.

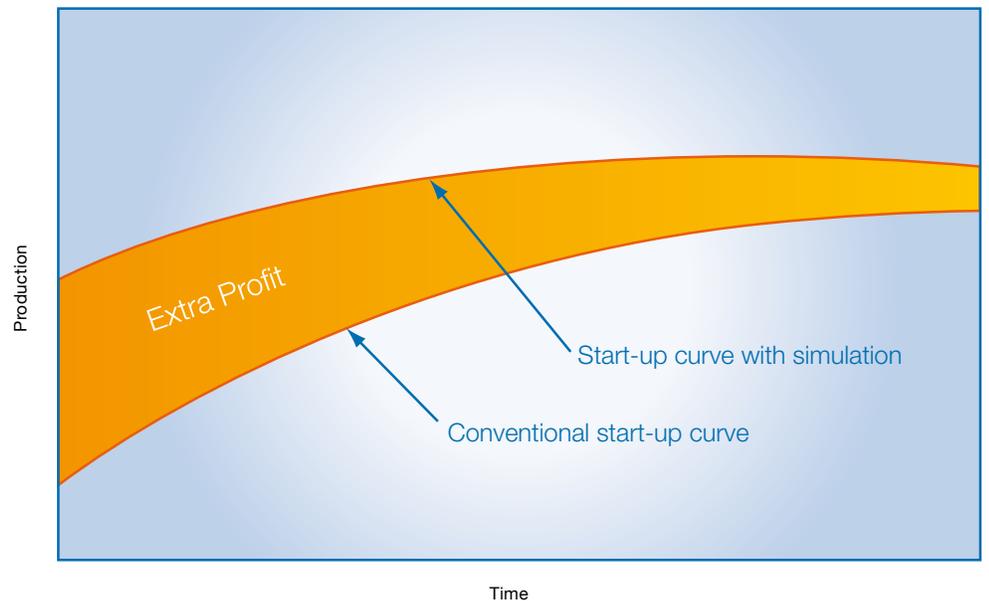
We are dedicated to working with you to help you harness the power of IDEAS. With your vision and our technology, the possibilities are limitless.

How IDEAS is implemented to help your project:

- We build process models of the facility based on P&IDs, pump curves, and other key components of the process.
- We connect these models to an offline version of the actual control logic.
- We then run a simulated start-up and verify and correct control logic against this “virtual plant,” months before start-up.
- The models are then used for operator training.

**Find out more:**

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**Benefits**

- Test and verify design concepts, quickly and at low cost and low risk
- Stage, test, and validate control logic to achieve faster start-up and increase return on investment
- Train operators without risking their safety or plant equipment



# The challenge: To design a process that you know will work before you commit capital

## The solution: IDEAS steady-state simulation

During the process design phase of a project, IDEAS is a quick and powerful tool that enables users to dynamically model a complete industrial project.

IDEAS helps you create a “virtual plant” environment in which process designs, modifications, and retrofits can be fine-tuned and verified, faster than in real time, before you commit to any capital costs.

Use the IDEAS simulator to solve complex engineering problems such as:

- Sizing or verifying new process equipment
- Predicting control or process response
- Predicting interaction with other equipment
- Designing control logic
- Increasing product quality

IDEAS is not just an “off-the-shelf” software package. The modular structure of IDEAS means that you do not have to buy a full-per-



formance, plant-wide package when you only need to simulate a small area. IDEAS can be customized by our process experts specifically for your industry, process, and site.

IDEAS has the ability to perform steady-state mass and energy balances; track components, compounds, and element flow and concentration; handle particle size distributions; and calculate specific gravity and excess enthalpy. IDEAS also has the flexibility to define chemical reactions. Depending on user needs, process reactions can either be user-defined (for most process analyses) or performed separately by a first principle

model (for example, OLI aqueous engine or Gibbs free energy minimization).

IDEAS acts as a superior tool for “what-if?” analysis of production and optimization. Steady-state models can link to operating costs, complex production logic, discrete simulation of discontinuous events, and to spreadsheets for dynamic exchange of data.

In addition, as the complexity of the project advances, steady-state models created in IDEAS can be easily converted to a dynamic environment to include detailed dynamic specifications and process control logic.

## Benefits

- Create live process flow sheets
- Quickly determine flows and temperatures
- Help verify the selection of process equipment
- Make economical design decisions



## Success story

**Customer:** UPM Wisaforest

**Simulation objective:**

- Recovery boiler process design
- Pretest control logic and debug errors
- Train mill operators

Upon completion, UPM Wisaforest's pulp mill in Pietarsaari, Finland, featured the largest chemical recovery plant (evaporation, recovery boiler, recausticizing, and lime re-burning) in the world.

IDEAS was used to produce a detailed dynamic simulation of the recovery boiler. It was then used to pretest the recovery boiler control logic by connecting to the Metso DNA control system. Using IDEAS, control logic experts were able to detect and debug errors.

IDEAS was also instrumental in training mill operators on the new recovery boiler. Operators were able to go through start-up and shutdown procedures many times on



the simulator prior to operating the actual recovery boiler.

There was no doubt that the IDEAS simulator played a key role in the successful start-up of the chemical recovery plant. "It took 22.5 months from the purchase decision to start-up," said Heikki Öhman, Technical Director of UPM Wisaforest, during the start-up of the chemical recovery plant. "The erection, tests, and approvals have all been completed, except for some final details. The start-up of the new plant has gone extremely

well. After a couple of days, we established a new record in pulp production."

The complete plant, supplied by ANDRITZ at a cost of over 100 MEUR, started up precisely on schedule.



# The challenge: To verify that your complicated control scheme will run your plant correctly

## The solution: IDEAS dynamic simulation

**IDEAS is an effective tool for control logic verification, helping to stage and test control systems quickly and accurately, reducing the steep curve to start-up.**

Implementation of control logic is a difficult task, since the performance of the plant is not only dependent upon the electrical and mechanical components, but also on the control logic and the design concept used to control those components.

That's where IDEAS enters the picture. If the control logic cannot start a simulation, it will not be able to start the actual equipment. By using IDEAS for control logic verification, you will reduce costly design errors that could otherwise delay start-up.

Studies have shown that using simulation to help with start-up can correct up to 82% of control logic problems before field implementation. The cost savings are enormous. Control logic verification translates into immediate savings through a smoother start-up and can easily realize a 200% or more return on investment.



IDEAS communicates with all major PLC or DCS equipment. Using our OPC server, OPC client, or one of our custom communication drivers, IDEAS makes the task of control system logic verification more manageable and consistent. In addition, new control logic can be tested and verified on the IDEAS simulator while the actual plant continues to run without interruption.

The biggest benefit of using IDEAS for your control logic verification is that our team works with you every step of the way. Our experts travel directly to your plant site, anywhere in the world, and work directly with the

equipment vendors, control company, and plant personnel during commissioning.



### Benefits

- Detect and correct up to 82% of control logic errors before field implementation
- Achieve quicker and smoother start-up, resulting in 200% return on investment

|  | DCS loop back | IDEAS model |
|--|---------------|-------------|
| I/O and loop test                      | ✓             | ✓           |
| Process-wide logic test                | x             | ✓           |
| Tuning constants known before start-up | x             | ✓           |
| Realistic process models               | x             | ✓✓          |
| Remove control logic errors            | x             | ✓✓          |
| Remove process intent errors           | x             | ✓✓          |
| Verify advanced control logic          | x             | ✓           |

## Success story

**Customer:** Aracruz Celulose

**Simulation objective:**

- Model process design
- Verify control logic
- Train plant operators

Aracruz Celulose was able to realize significant savings by using IDEAS on the Fábrica C expansion project at its kraft pulp mill in Brazil. The first job for IDEAS was to simulate and verify the process.

“The simulator allowed not only a comprehensive check-out of the process models, but also verification of the process control strategy,” said André Luis Bogo and Patrícia Nunes. “(This) contributed to a comprehensive commissioning process and to one of the fastest and most effective start-ups yet witnessed in the industry.”

IDEAS was also used to stage the entire DCS of the expansion. IDEAS experts traveled to the mill site in Brazil and worked directly with equipment vendors, control company, and mill personnel during commissioning. Over 1,800 DCS errors were corrected, helping the mill to achieve a record start-up of 17%



above target, a figure that will see the mill generate millions in additional revenue.

Operators were also able to learn how to run the new systems at the mill by using IDEAS.

“The whole mill was operating like it was ‘real’ a full two months before start-up,” said Renato Guéron, Project Director for Aracruz

Celulose. “The IDEAS simulation software for our new pulping line gave our operators a head start. The simulation was so close to the actual running of the line that start-up was easy, and the ramping up process was unusually fast. When you are aiming for 2,000 t/d on average, a lot of pressure was put on all of us. IDEAS reduced the pressure dramatically.”



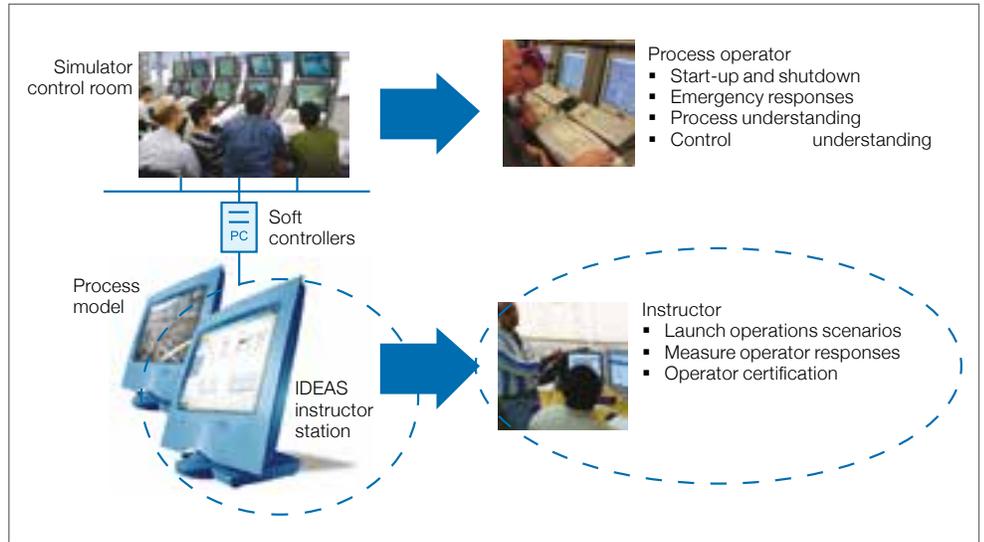
# The challenge: To train your operators on a process—and meet your start-up schedule

## The solution: IDEAS instructor

**IDEAS is an essential tool for operator training; it works like a flight simulator, allowing trainees to gain realistic, hands-on experience without inflicting harm to themselves, the environment, or the plant.**

The IDEAS instructor module can help train operators months before the actual plant is up and running. It helps produce better trained operators—operators who will start up new processes faster, react more wisely to plant upsets, and be more productive.

IDEAS instructor contains preconfigured scenarios that teach, train, and challenge trainees on process upsets, including two of the most intensive and complex procedures—start-up and shutdown. We can all imagine this scenario: a relatively new operator is on shift when suddenly a tailings line starts to sand-out. In most cases, such a scenario would have significant safety, environmental, or production consequences—but your new operator, who has practiced start-up and shutdown on the IDEAS simulator, immediately makes the cor-



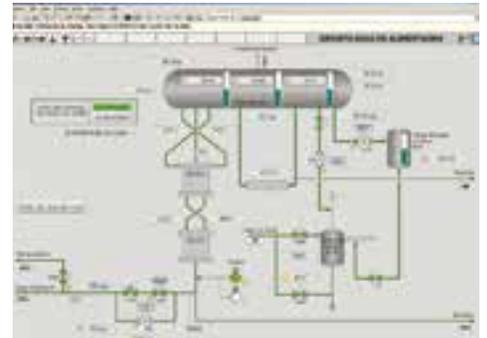
▲ Where IDEAS instructor fits into an operator training system

rect decisions and your operation continues without incident.

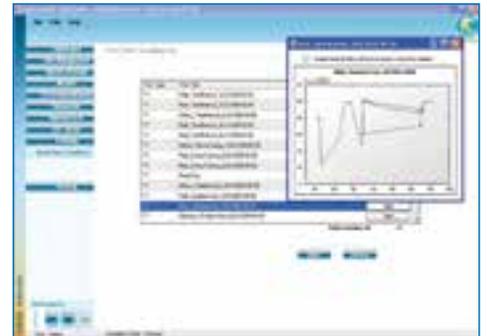
### Operator interface

The simulator allows the actual plant configuration to be loaded into the training system, so that operators will be trained using the same interface (including the same logic, keyboard, and graphics) as the actual plant. The simulator enhances the learning process by actively involving the operators and providing immediate feedback without risk to production.

The view from the simulator is identical to the actual DCS screen. ▼



A screen shot from IDEAS instructor demonstrates the easy-to-use interface. ▼



## Benefits

- Teach plant operators safely and reliably
- Have personnel practice intensive and complex procedures
- Monitor trainee progress and assess performance
- Standardize and create consistent training

### Instructor interface

IDEAS instructor software enables you to track individual employee performance, including login and fault scenario management. The operators' performance in executing start-up, shutdown, and normal operating procedures is assessed by tracking selected process variables (for example, temperature, pressure, and flow).

## Success story

**Customer:** CMPC Celulosa

**Simulation objective:**

- Model process design
- Control logic verification
- Train mill operators

IDEAS helped the Santa Fe mill in Chile start up its fiberline in just 171 days.

IDEAS was used to provide dynamic models of Santa Fe's processes, which were used to test the control systems before start-up. During commissioning, the ANDRITZ AUTOMATION team worked with other EPC vendors to make sure that all critical logic errors were removed. There can be no doubt, however, that one of the most critical factors in Santa Fe's successful start-up was the use of IDEAS for operator training.

"The main objective of the IDEAS simulator was to prepare our operators before the opening of the Santa Fe plant," said Javier González, Project Engineer for CMPC Celulosa. "The result was very good; I would say excellent. The users' understanding of the simulation's objectives was very well accomplished, as they made their way out from situations of difficult scenarios of operation." Jorge Reyes, CMPC Celulosa's Fiberline Superintendent added, "One of the main



challenges for the Santa Fe Expansion project was that the teams would operate in an optimum way, not only the teams, but the processes and the different areas and to comply with the timeframe that we had defined."

"The technology of IDEAS was quite important since it was used to check the control

ties during the commissioning and construction phase, and it was also important for the preparation of the operators since they were qualified months before start-up."



# The challenge: To realize the best net present value on your capital project

## The solution: IDEAS simulation

**IDEAS is the simulator of choice for the kraft pulp mill industry, being used by virtually every major pulp line to come online in the last decade.**

IDEAS has been used to help the world's largest pulp mills achieve start-ups that are faster, smoother, safer — and more economical. By using IDEAS, mills have realized significant savings.

### Simulation experts

We can model any vendor equipment and are able to communicate with every DCS supplier, so your operators train on the same graphics and logic that they will use in the actual mill.

### Realistic process models

IDEAS has realistic models to accurately represent your process, based on first principles of chemistry and physics. IDEAS allows you to model your mill or process at a micro or macro level of fidelity, depending on your need.

IDEAS helped these mills achieve record-setting start-ups:

- Aracruz Fábrica “C”
- Veracel
- CMPC Santa Fe II
- Botnia

$$\begin{array}{ccccccc}
 \text{Start-up} & & & & & & \text{Additional} \\
 \text{tonnes/month} & & & \text{Months} & & & \text{Revenue} \\
 \vdots & & & \vdots & & & \vdots \\
 60,000 & \times & \$400 & \times & 5 & \times & 17\% & = & \$20,400,000 \\
 & & \vdots & & & & \vdots & & \\
 & & \text{Incremental} & & & & \text{Additional} & & \\
 & & \text{\$/tonne} & & & & \text{production (\%)} & & 
 \end{array}$$

▲ **Increase your revenue**  
Sample calculation, showing return on investment of simulation on start-up

### Smooth start-up

IDEAS catches hundreds of errors in control logic before start-up, which means your plant achieves products on—or ahead of—schedule.

### On-site implementation

Our personnel include experienced pulp and paper project managers who understand your industry. We travel directly to your site to work with vendors and control suppliers during commissioning.

### Risk-free training

The IDEAS instructor module allows staging and operator training to take place in complete safety, without risk to your employees or the environment.

The data agrees. At one South American plant, operators used the IDEAS simulator to practice start-up, shutdown, and emergency sequences in the months prior to start-up. This allowed the operators to be better prepared when it came to the operation of the actual plant.

A standardized test with approximately 300 random questions was developed to test operator competency. The test questions were

given in three intervals, once before any training, once after class training, then once again after IDEAS training. The results clearly showed that the IDEAS training made a remarkable improvement in operator competency.

| Student competency       |       |
|--------------------------|-------|
| Before any training      | 20.3% |
| After classroom training | 26.7% |
| After IDEAS training     | 85.0% |

### Ongoing benefits

Since IDEAS is modular and scaleable in design, many mills continue to use the simulator past start-up for a variety of applications, including process design and training of new operators.

### Return on investment

The IDEAS simulator acts as a virtual plant that will help pinpoint plant production improvements and shorten projected start-up dates. In many cases, the IDEAS return on investment has been over 200%.

## Success story

**Customer:** Oy Metsä-Botnia AB

**Simulation objective:**

- Model process design
- Control logic verification
- Train mill operators

The 1.2B USD greenfield mill in Fray Bentos, Uruguay, represents Botnia's first large investment outside of the company's native Finland. Having helped mills in Brazil (Aracruz, Veracel, VCP), Chile (CMPC, Arauco), and Finland (UPM Wisaforest) achieve record-setting start-ups, ANDRITZ AUTOMATION was chosen to supply dynamic simulation to the Fray Bentos mill.

The IDEAS simulator was used to model the key processes of the mill, providing feedback to the mill's distributed control system so that the control logic and process interactions could be fully configured and tested



before start-up. IDEAS was also used to train operators, giving them the experience and skill to handle events such as start-ups, shutdowns, and process disturbances.

By using IDEAS, the mill was able to reach its nominal daily capacity (about 3,000 t/d)

just 145 days after start-up. This was a new record for start-up, the previous best being 171 days.



# Automation solutions

## Release your full potential



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