MEASUREMENTS, CONSUMPTION AND OPERATING COSTS

IntelliVea

What does one hour of production cost you?

Connect measurements, consumption and costs.
See where to look for savings.



For heat, electricity, compressed air
and other energy utilities.

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WHY IntelliVea

Your equipment is running. How efficiently?

Higher consumption does not necessarily mean a problem. Maybe you just produce more. It is important to compare consumption with what you get for it.

The boiler supplies heat, the compressor supplies air, and the turbine supplies electricity. The operation sees pressure, flow or power. Economics, on the other hand, works with prices, sales and costs. IntelliVea helps to bring this data together to make it clearer how the way of operation affects the production result.

Technical view

How much fuel or electricity do we need for the same amount of produced media? How does this ratio change with different performance?

Economic view

What does the change in consumption mean at today's input price? What are the sales, costs and profit per hour?

The deviation takes on a specific meaning

The consumption standard is the amount of input required per unit of production. If, for example, you need more fuel for the same amount of heat, its cost also increases. In IntelliVea you can follow this connection in the curve and transfer it to your own calculation.

The same data for the technician and the supervisor

The technician can address the cause of the higher consumption. The manager sees the cost implications of her review. Both are based on the same measurements and an agreed calculation.

> Start with the question you need to solve
> For example: "Why does it cost us more to produce the same amount of steam today?" From it you can deduce which measurements, prices and comparisons you need.

CONNECTION AND DATA STORAGE

Build on data from your operation.

Your measurement and control systems will prepare the values. IntelliVea reads them from the connected customer database.



Measurements have a common place

Sensors and meters feed data into your systems. They record the selected values in the agreed table of measurements. From there, the IntelliVea uses them in its calculations and waveform display.

The operating tables are stored with you

Measurements and curve data points remain in the connected customer database. The IntelliVea system database stores users, access permissions, layouts and process diagram definitions. For display and calculation, the application reads operating values through the configured connection.

The connection will be set up with your administrator

The project supports PostgreSQL and Microsoft SQL Server. On boot, the connection, necessary permissions, and measurement feed are set up. It also includes unit verification and data up-to-dateness.

> ### What you need in the beginning
> Select your device and available measurements. We will then agree with the administrator or control supplier how the necessary values will get into the measurement table.

TABLE OF MEASUREMENTS

Bring pressure, flow rate and power into one view.

In the measurement table, you prepare the quantities you want to work with in IntelliVea.



Each piece of data has a name, a unit, and a value

It can be temperature, pressure, electrical input or the amount of produced medium. You also set the number of decimal places and add a note. It is thus clear what the given value means for further work.

Measured and calculated quantities together

The measured data comes from your systems. The calculated data is created from a formula, for example, the ratio of consumption and production. Both can enter curves and other calculations.

What does endpoint mean?

It is the designation of a specific measured or calculated data. Think of it as a named item: for example "Compressor Power". The formula or curve then references this item to use the correct value.

> ### Units decide
> Power in kilowatts and energy in kilowatt hours mean different things. When preparing your measurements, it is worth checking that you are using the appropriate quantities and time bases together in the calculation.

CALCULATED DATA

The two measurements produce a useful answer.

The power consumption itself tells how much the device is currently drawing. In conjunction with production, it will show how much energy a unit of output costs.

The calculated endpoint has its own formula. In it, you'll use references to existing measurements, numbers, parentheses, and basic math operations. The result can be further used as a separate quantity.

What you need to find out	Simple calculation principle
Consumption per unit of production	Input consumption ÷ amount of output in the same time
The difference between two values	First data - second data
Cost of the input consumed	Quantity consumed × unit price
Sum of partial flows	First stream + second stream + other streams

Example: fuel needed to produce heat

In one hour, you produce 5 MWh of heat and consume fuel with an energy of 6 MWh. The ratio is 1.2 MWh of fuel for 1 MWh of heat. You can monitor this ratio at different power levels, not just the total fuel consumption.

The calculation relies on named inputs

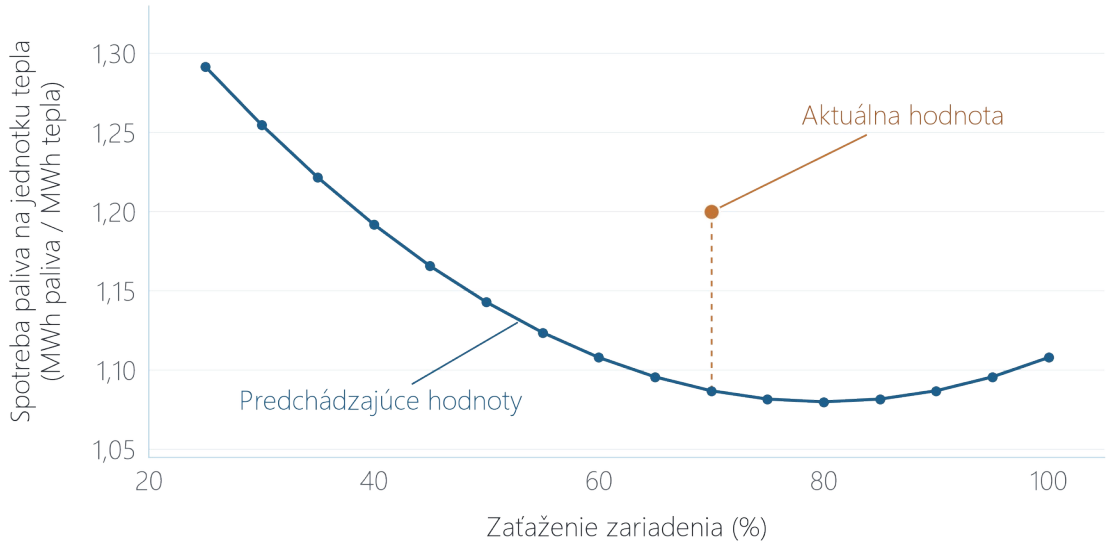
When the incoming values change, the next recalculation will also change the result. It remains visible in the definition what it is calculated from. When preparing a formula, you can also check its entry.

> Illustrative example
> The values on this page serve to explain the principle. In your operation, the calculation will be set according to the available measurements and the correct physical units.

DEPENDENCE CURVES

At what output do you produce more economically?

The curve connects two quantities. For example, the power of the device and the amount of energy required per unit of its production.



Compare similar operations

The load of the device can be on the horizontal axis, and its consumption standard on the vertical axis. From the previous values, you can see how this ratio behaved at different performances. The current point will show where you are now.

A point above normal is a reason for inspection

If you need more input for similar performance, it's worth looking for the cause. This could be a change in terms, settings or technical status. The curve helps to find the deviation and prepare questions for operation.

You choose the pair of quantities yourself

When you create a curve, you specify a figure for the X-axis and a figure for the Y-axis. Therefore, you can track a relationship that is relevant to a particular device, for example, power and consumption rate or flow and power.

> ### How to read a picture
> The chart above is a stand-alone illustrative sample with model data, not an application screen or a specific customer result.

BANDS AND TIME COMPARISON

A good number depends on what you are measuring.

You determine the operating limits according to your device. The colors then help to recognize more quickly where the current value belongs.

Set thresholds for each measurement

You add intervals and colors to a specific size. In the chart, the bands are displayed on the corresponding axis. You can thus mark, for example, a suitable power range or an area of increased consumption.

What you set	What will it do for you?
Lower and upper band limits	You define a scope with specific operational significance.
Band color	When looking at the graph, you can more easily distinguish individual areas.
Total period	You will look at the course of the curve collected over the entire period.
Specific year	You will examine a curve created from the year's values.
Minimum, maximum and current point	You have additional reference data when assessing the course of the curve.

View the full period or individual years

The system completes the curves for the entire period even after years. In the browser, you select the period you want to research. This is useful, for example, when asking whether the device's usual behavior has changed after modification.

Consider the conditions when comparing

Different fuel, different pressure or changed production method can affect the curve. The difference between the years is a basis for further assessment. The technician will fill in what has changed in the operation during this period.

> ### Bands are not universal
> The limits for one boiler or compressor may not suit another. They are set up with someone who knows the technology and its operational limitations.

CURVES, LAYOUTS AND ACCESS

Keep the charts you need together.

With a regular check, you want to look at important devices without having to reassemble the entire overview each time.

Overview according to your work

You open the charts you need, organize them and save the layout under your own name. You can come back to it later.

Approach according to responsibility

With the curve, you specify the users who can access it. You can thus make data available to people who need it at work.

One layout for the boiler room, another for the compressors

A saved layout can contain multiple charts. For example, the consumption standard and the performance of selected devices that you assess together. You adapt the selection to your own operation.

Detail for closer examination

In a separate graph, you can see the curve points, the current value and the set bands. When moving over the graph, you can read the coordinates. The browser continuously refreshes the data according to the set operation of the application and resource availability.

Users and assigned curves

You can find organization members in the user list. Access to the curve is assigned to a specific user and can be revoked. The layout decides what a person opens next to him; the approach determines which curves it reaches.

> ### A practical advantage
> Before the meeting, you open a saved view of the devices you're going to talk about. You can address operational differences and issues arising from them.

OPERATION DIAGRAMS

Put together a picture of your own production.

You can organize measurements and calculations into a diagram that resembles the flow of your technology.



From the device to its result

You add objects, labels, active values, and busbars to the workspace. For a specific device, you can display the data you want to monitor or the output from the calculation module.

Layout according to how you think about the operation

You move, resize, and modify the appearance of elements. The diagram can highlight the main flow of production and next to it show consumption or economic result. You prepare it for a specific purpose, not according to a fixed universal screen.

Own and shared projects

Operating diagrams are saved as projects. A project can be assigned view or edit access. A technician and a colleague from economics can thus work with one agreed production model.

> ### The picture explains the principle
> The illustration shows the continuity of the devices. You create the actual diagram from your own elements, measurements and calculations directly in IntelliVea.

CALCULATION MODULES

Prepared blocks for common calculations.

You can divide a more complex calculation into smaller parts. For each, it is then clear which inputs it uses and which result it passes on.

Module	What will you prepare with it?
Sum and difference	Addition of flows or difference between inputs.
Multiplication and division	Calculations according to quantity, proportions and consumption per unit of production.
Energy source	Freight according to the quantity of the input and its price, with the appropriate conversion of the price unit.
Energy efficiency	Recalculation of the required energy input from the known output and specified efficiency.
Fixed cost per hour	Distribution of the load according to the specified number of hours.
Interpolation	Estimation of the value between the specified characteristic points.
Custom formula	Calculation from selected inputs according to your needs.

Example: from consumption to cost

One block prepares the required amount of input, another connects it to the price. You then use the result as an expense line. When the input value changes, the subsequent result changes during the conversion.

When calculating, you know where the number came from

Modules have a name, type, inputs, and output. This allows you to return to a specific step when editing the model. Both calculations and units are prepared according to the technology you are modeling.

> ### What does interpolation mean?
> If you know the value at 40 power and at 60 power, interpolation will allow you to estimate the value between them. Uses specified points; it does not itself predict the future behavior of the device.

ECONOMICS OF PRODUCTION

You can convert the technical values into money.

Add sales and costs to the operating diagram. IntelliVea evaluates them on an hourly basis according to the set model.



Different costs, common time basis

You can include variable and fixed costs, personnel costs, depreciation and other items in the calculation. Each active line has its own formula and classification between sales or expenses.

Allocate monthly and annual amounts to operating hours

Enter a cost per hour, month or year. The configured operating hours determine the conversion. For example, an annual cost of 60,000 euros spread over 6,000 operating hours equals 10 euros per hour.

The result will show the difference between sales and costs

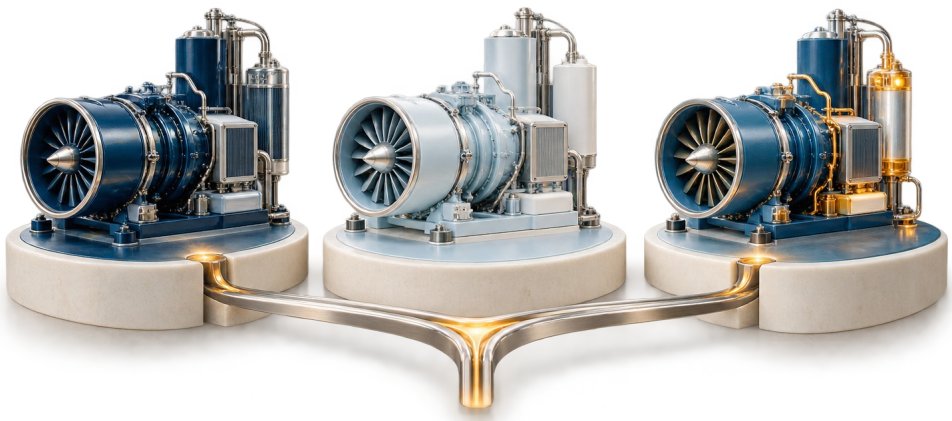
From continuously available values and entered formulas, a result will be created in currency per hour. Its meaning depends on which items you have included in the model and how you have set them up.

> Important when preparing the calculation
> Agree whether you are only assessing energy consumption, selected operating costs or a wider production result. That way, everyone will know what the displayed amount includes.

PLAN AND SIMULATIONS

What changes when an input price rises?

You can recalculate the same operating scheme from actual data, plan values or two simulation variants.



The current state is based on measurements

In Live mode, values from the attached measurement table are used. The calculation will thus show the result according to the available operating inputs and the set economic lines.

The plan and two variants will use the specified values

You can prepare your own input values for Plan, Simulation 1 and Simulation 2 modes. By switching the mode, you will examine how the result changes with the same calculation rules.

You review the decision in advance

You can assess a different energy price, a different performance or a changed consumption standard. Variants are recalculated in the model. They will provide the basis for a conversation about which setting makes sense to check in real operation.

> ### Try one change at a time
> To find the effect of fuel price, keep the other inputs the same. You can then more easily see which change made the difference in the result.

EXAMPLE OF ECONOMIC IMPACT

A small difference in consumption is repeated every hour.

Express a deviation as a cost and it becomes easier to decide what deserves attention.

Let's imagine heat production with an output of 5 MW. With the same output, we compare two ratios of fuel consumption: 1.1 and 1.2 MWh of fuel per 1 MWh of heat. The price of fuel in this example is 50 euros per MWh.

Model example item	Calculation or value
Heat produced per hour	5 MWh
Fuel at a ratio of 1.1	5 × 1.1 = 5.5 MWh
Fuel at a ratio of 1.2	5 × 1.2 = 6.0 MWh
The difference in consumption per hour	0.5 MWh of fuel
Difference in hourly cost	0.5 × 50 = 25 euros
At 6,000 identical hours	25 × 6,000 = 150,000 euros

The number will help determine the priority

The detected difference does not by itself say what intervention needs to be done. However, it will show how much weight a cause check can have. Both the technical possibilities and the costs of improvement can then be assessed.

In IntelliVea you connect the necessary parts

The measurements will supply the power and consumption, the calculated figure will prepare the ratio and the economic line will use the price. The curve will help to compare the consumption norm at a similar performance.

> ### Model values, not the promise of savings
> Prices, operating hours and consumption are chosen for explanation only. The annual conversion assumes the same deviation during all the listed hours. Actual benefit will be assessed based on your data.

COMMON VIEW OF PRODUCTION

Give operations and finance a common basis for decisions.

Everyone may be looking at a different part of the problem. Measurements and an understandable model give them common ground.



For the technologist and energy engineer

Curves and actual values will help you find operating conditions worth checking. For specific performance, you can examine consumption, bands and differences between periods.

For the manager and the economist

Cost rows show what the calculation includes. Scenarios help you discuss how input prices and operating assumptions affect the hourly result.

For the team that decides to change

The question no longer has to be just "consumption is high". Together, you can assess at what state it is growing, how much it means in terms of money, and what data you still need before deciding to intervene.

> ### Usage according to your technology
> The principle can be prepared for the production of heat, compressed air, electricity or other media. Specific measurements and calculations are always selected according to the monitored device.

COMMISSIONING

Start with one piece of equipment and a clear question.

On the first model, you can check the data supply, the meaning of the curves and the method of calculating costs.

Step	What will we prepare together?
1. Goal	We select the device and the question you need to solve.
2. Data	We'll go over the available measurements, their units, and how to update them.
3. Connection	Together with the administrator, we will set up the connected database and writing the necessary values.
4. Comparison	We will create calculated data, suitable curves and operating bands.
5. Economy	We will add prices, cost lines, operating hours and variants.
6. Use	We will verify the results with the responsible people and prepare the necessary views and access permissions.

Practical materials are enough for the first meeting

A brief description of the equipment, a list of available measurements and an idea of what costs you want to assess will help. Invite a person from operations and an administrator or supplier of an information system.

We will check the results on a known situation

We'll pick a state you understand and walk it from the measurement to the resulting amount. In this way, you can check whether the calculation corresponds to your technology and how you want to evaluate production.

> ### You can add other devices as needed
> After validating the first model, the range of measurements, curves and diagrams can be expanded. You can assess the benefit based on specific questions from your operation.

LET'S CONNECT

Where does production cost you more today than it should?

Let's go through one of your devices and the data you already have. We will show what can be found out from them.



Do you have measurements but lack context?

We will help you name the quantities that make sense to compare. Together, we will prepare a path from consumption and performance to the questions you need to solve in operation.

Do you want to link technical status with costs?

We will go through the options of the operating scheme, economic lines and variants. The calculation will be based on your technology, prices and way of working.

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Understand what drives your production costs.