# ANY INDUSTRIAL DATA

## SYSTEM OF COLLECTING AND VISUALIZATING OF TECHNOLOGICAL DATA

22. October 2020

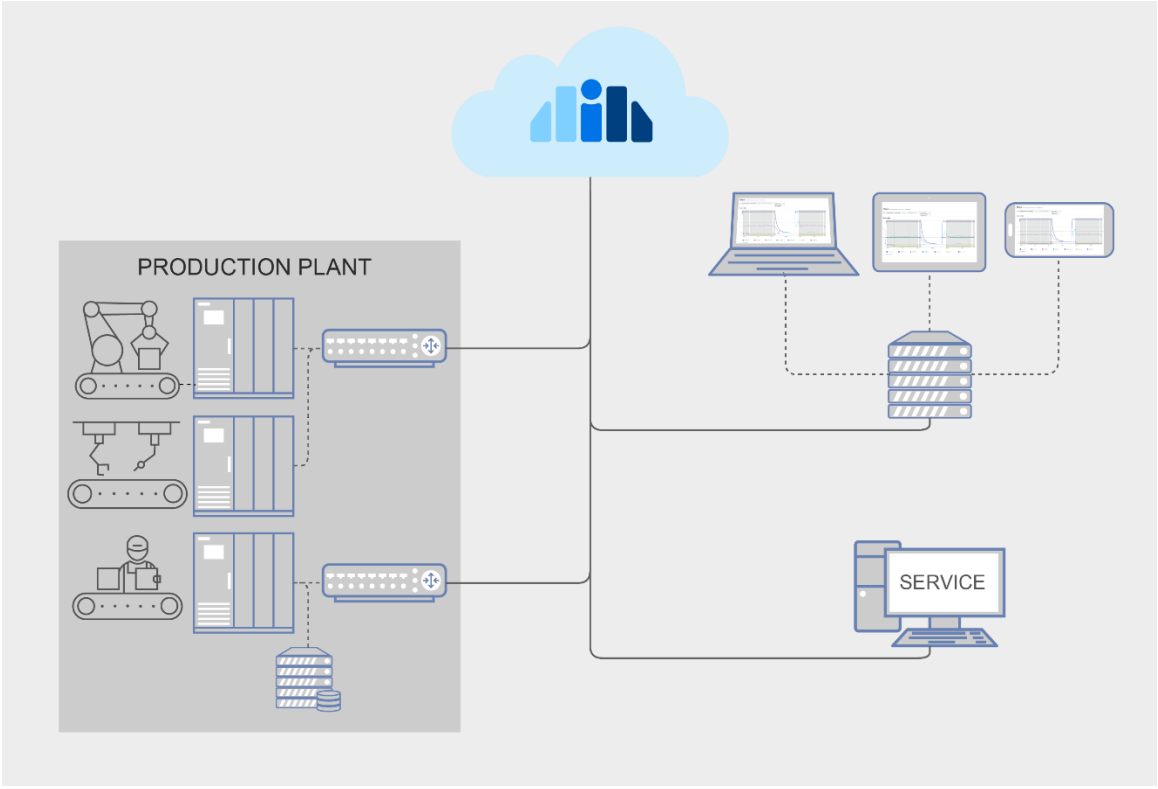
# Table of content

1. INTRODUCTION ..... 3
1.1. Advantages over similar services provided by ordinary companies ..... 4
2. BASIC DESCRIPTION OF THE CURRENT FUNCTIONALITY OF THE AiD APPLICATION ..... 5
2.1. Production part data (recording of production data of individual parts) ..... 6
2.2. Productivity (record of numbers of pieces produced and types of products) ..... 7
2.3. Cycle data (cyclic data recording) ..... 8
3. USE OF INFORMATION OBTAINED BY AiD APPLICATIONS ..... 9

# 1. INTRODUCTION

The system of data collection and visualization from production technologies (lines, individual machines, ...) was developed under the name **Any Industrial Data** (hereinafter "AiD") by EPR s.r.o. (hereinafter referred to as the "supplier") and has already been applied and tested on production technologies in recent years.

The AiD system communicates with the cloud storage via a secure internet connection, where it stores the required data in real time. The AiD web application is then used to clearly display this data. There, the authorized user can access online and historical records of individual technologies. These users can access and view data from virtually anywhere they have an Internet connection. A personal computer, smartphone or tablet can be used to display data. Data can also be exported to various spreadsheet formats (e.g. Microsoft Excel, csv, ...) and then processed, externally backed up, etc. The AiD system also allows the provision of APIs for communication with external programs and thus can, for example, the customer's internal system process stored data.




Data from production technologies (e.g. times, temperatures, pressures, energy outputs, material lengths, etc.) can not only display the AiD system, but also automatically recalculate (e.g. production productivity, electricity consumption per part, lengths of material consumed, line production cycle time, etc.) for arbitrarily selected time periods. It is also possible, of course, to filter the monitored data according to the production recipes (product types) that the given technology produces.

**The system can be freely developed and modified according to the requirements and needs of the customer.**

## 1.1. Advantages over similar services provided by ordinary companies

- **Data are collected directly from the control PLCs of production technologies** and use internal information about the status of the line (so they do not work only with information from externally mounted sensors). So they have a much higher informative value.
- **No data loss due to communication failures between the production technology** and the secure cloud storage. This is because the data is always first backed up with time stamps directly in the PLC cache of the production technology. After the connection between the PLC production technology and the cloud storage is restored (after its eventual failure), all data from the cache are transferred to the storage without loss.
- **In addition, the connection between the production technology** and the cloud storage can be easily used as a communication channel for remote technology management by PLC programmers. It is thus possible to implement diagnostics of lines and machines, remote modification of the PLC program in case of accidents, etc. This communication channel can also be made available to external programmers or employees of the customer after granting permanent or temporary access rights. A group of such authorized persons can then connect to the line from anywhere with an Internet connection.
- **The network connection of the technology to the Internet can be safely separated** from the factory's internal Ethernet network of the production plant. There is therefore no risk of unauthorized access to any of these networks.
- **In addition, within the network of technology connection to the Internet**, the individual technological groups (lines, machines) are consistently separated from each other and thus there is no mutual influence.
- **To restore the Internet connection of the technology with the cloud after the event. the connection will fail automatically** (no need to re-establish the connection manually). In the event of a longer connection failure, the technology reports this fact to the operator with an error message.

# 2. BASIC DESCRIPTION OF THE CURRENT FUNCTIONALITY OF THE AiD APPLICATION

For all three views of the technology below via AiD graphs, in the graphical display you can move the mouse arbitrarily, zoom in (mouse wheel or hold down the Ctrl key), set any display time range, etc. Double-clicking on the graph always sets the full display in the axis 'Y' of the graph, if previously zoomed.

Data can be filtered, for example, by product type or by production recipe.

All data can also be exported to a Microsoft Excel spreadsheet - see the "Data export" item in the leftmost column of the screen at the bottom.

All functionalities listed in this chapter can be changed, supplemented or modified in any way according to the customer's wishes in agreement with the supplier's employees.

Three basic views on manufacturing technology through the application of aid:

## 2.1. Production part data (recording of production data of individual parts)

The data can be displayed in the form of a graph or table.

The timeline shows the production data for the part at the time the part leaves the machine or line. The data represents the part data that was recorded during its pass of the production process - always at the appropriate time (e.g., temperature pyrometer at the moment of leaving the manufacturing station infra - heating). Thus, the data are not a record of all quantities of technology for the relevant part from one moment, but are successively stored data of each manufactured part. The moments of storing this data therefore have no time connection with the cyclical storage of machine data - see 2.3 . This way of displaying gives a good overview of whether all parts were manufactured under the same technological conditions as the variance of operating values, etc. delays in production are clearly visible.
When displayed on a graph the cursor can be moved between parts and the legend of the graph is at the bottom. Each color symbol values specific value of the individual part data.

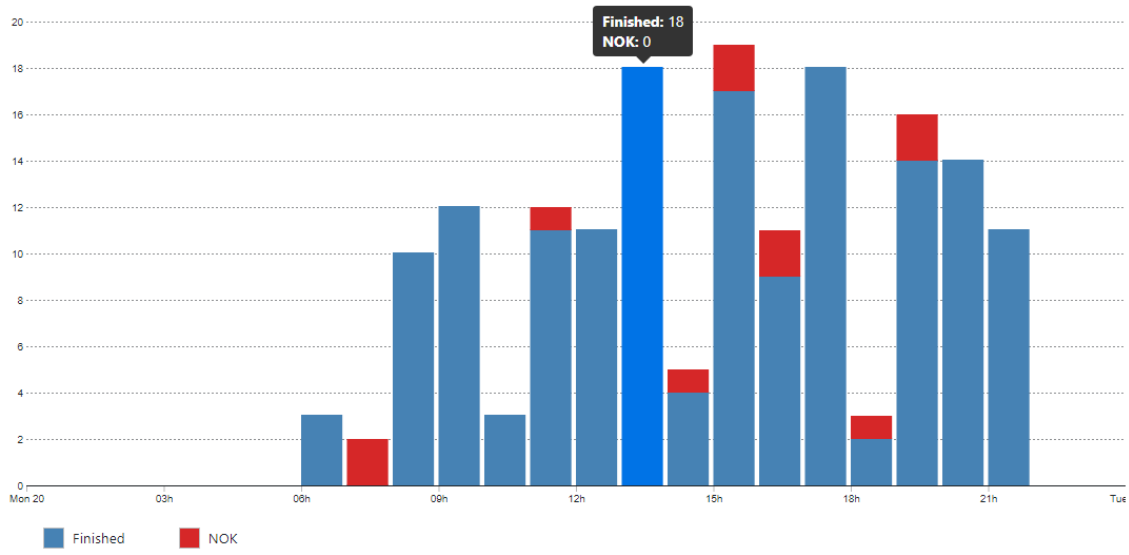

At the top of the screen is also the total number of parts (completed and unfinished) and the average time per part produced for the entire display period.

## 2.2. Productivity (record of numbers of pieces produced and types of products)

The data can be displayed in the form of a graph.

The bar graph shows the number of manufactured parts on the selected time basis (hour, day, week, month) in the specified time range. At the bottom left below the graph, the table clearly shows how many types of parts (recipes) were produced in the entire specified time range. If the cursor points to a specific column in the graph, another table will appear below the graph, which clearly shows how many types of parts (recipes) were produced in a given time period.

**Productivity**



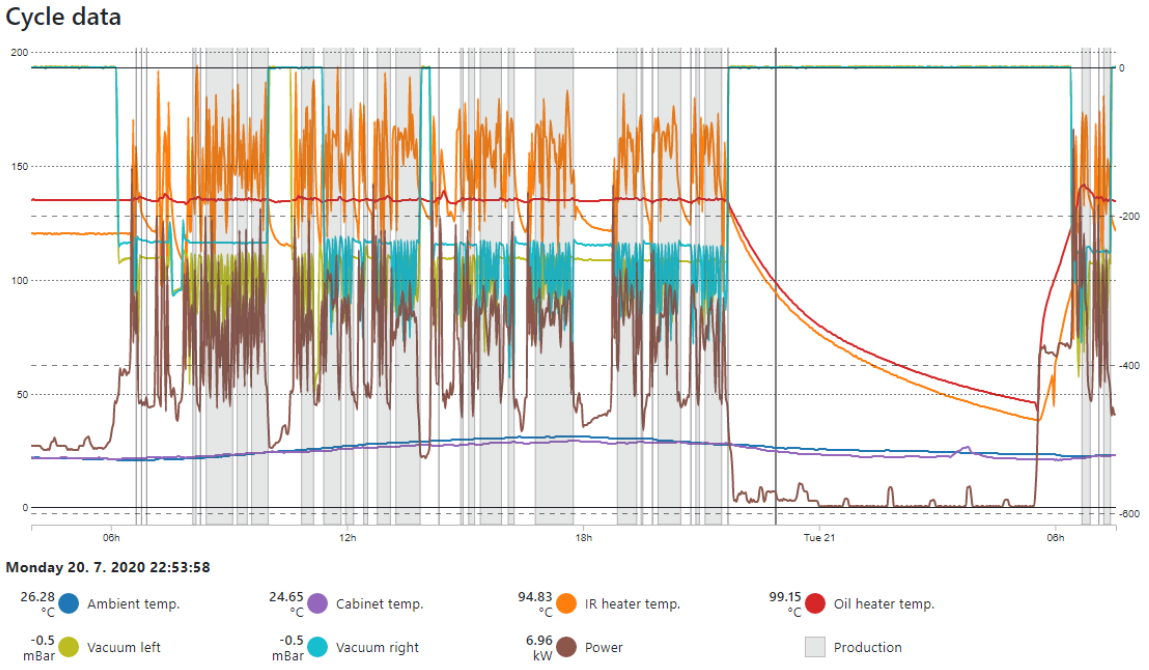

| Range | Recipe | Finished parts | NOK parts |
|---|---|---|---|
| 20.07.2020 00:00 - 21.07.2020 00:00 | 1 | 64 | 8 |
| | 6 | 93 | 3 |
| Sum | | 157 | 11 |

| Selection | Recipe | Finished parts | NOK parts |
|---|---|---|---|
| 20.07.2020 13:00 - 14:00 | 1 | 8 | 0 |
| | 6 | 10 | 0 |
| Sum | | 18 | 0 |

## 2.3. Cycle data (cyclic data recording)

The data can be displayed in the form of a graph or table.

Continuous monitoring of machine parameters (e.g. temperature, pressure, performances etc.) regardless, whether the machine produces or not. Quantities machines are cyclically stored and displayed at regular intervals (standard after one minute). In addition, the system can store quantities even in technologically important moments.




When displayed on a graph, for information represented produced (only technologically finished) parts by a vertical line at the moment when leaving the machine or line. To view these individual lines need graph sufficiently closer on the time axis. If the production frequency is too high or a longer period of time is displayed, these lines of finished products merge into a uniform gray area.

The values in the graphical display of the cyclic data are interspersed with continuous curves. Only when the graph is sufficiently zoomed in, there can be seen the individual data with specific values without interpolation by the curves.

If the measured quantities include the consumption of electricity. energy, you can see energy for the whole displayed period of time together with the calculation of the respective energy belonging to each completed displayed manufactured part at the top of the page.

# 3. USE OF INFORMATION OBTAINED BY AiD APPLICATIONS

With a proper understanding of the data and information obtained using the AiD application, this data can be further used and, for example, meaningful measures leading to better economic results can be implemented.

**Examples of the use of information based on the analysis of AiD application data in various areas:**

**- Analysis of working time, downtime of production technologies and the number of manufactured parts**

- Better use of machine and line capacity
- Identification of downtimes and failures of machines and lines
- More efficient planning of parts production on individual machines and lines
- Controlling the use of technology by employees
- Monitoring of planned production
- Only awareness of data collection of workers involved in the production, increase productivity and production efficiency

**- Analysis of consumed energy**

- Control of energy consumption per individual manufactured part in continuous production and in terms of longer periods of time
- Comparison of economy of different technologies producing the same parts
- Monitoring the top performance of the machine - better planning of energy supply capacities
- Monitoring the stability of electricity consumption energy (finding out the causes of fluctuations in consumption)
- Make sure employees don't leave technology on unnecessarily turned on

**- Analysis of material consumption**

- Comparison of the amount of input raw materials with the number of actually produced parts
- Planning the purchase of raw materials

**- Analysis of production parameters and quantities related to technology**

- Monitoring of values and stability of individual production parameters of parts
- Checking staff to see if they change important recipe parameter data
- Possibility to use the collected data as a document in customer audits
- Traceability of production parameters of individual specific parts when retrofitting machines with label printers or other means of marking
- Monitoring the status of external technological nodes (heating, cooling, robots)
- Control of operator entry into the machine, material handling, etc.
- Monitoring of ambient temperature (in the production hall) and its influence on the quality of production

- Monitoring of the temperature in the switchboard - prevention of failures of control components (monitoring of the activation of the refrigerant and its sufficient capacity)
- Possibility of additional introduction of monitoring of production recipe management and setting of limits of individual production parameters, compliance with which is conditioned by declaration of manufactured part as OK-part
- Possibility of additional implementation of monitoring the management of access passwords to the machine (it is possible, for example, with chip cards of workers with different levels of authorization to control the machine). This can ensure accountability for changes in production recipes.