*Joint-stock company ARTI-Tambovgalvanotechnika*

# JSC “TAGAT” BE FIRST IN CREATING BEST


392030, Russia, Tambov,
Morshanskoe shosse, 21
Phone: +7 (4752) 53 70 03
Fax: +7 (4752) 45 04 15
office@tagat.ru
www.tagat.ru

# Dear Ladies and Gentlemen!

## PLEASE LET US INTRODUCE OUR FACTORY

*AND PRODUCTS THAT WE SELL IN 42 COUNTRIES OF THE WORLD*

“TAGAT” FACTORY WAS FOUNDED IN 1941 AND FROM 1961 HAS BEEN A LEADING RUSSIAN ENTERPRISE SPECIALISING IN DESIGNING AND MANUFACTURING ELECTROPLATING AND CHEMICAL COATING EQUIPMENT

WE ALSO PRODUCE ECOLOGICAL EQUIPMENT: WATER-PROCESSING SYSTEMS AND WATER TREATMENT FACILITIES

# About Us

JSC “TAGAT” is a specialised enterprise designing and manufacturing equipment for galvanic, chemical and anodic oxide coating as well as wastewater treatment systems

All of TAGAT’s equipment is in line with Russian and International norms and quality standards as well as environmental protection standards

## TAGAT works with projects of any complexity

designs and builds both individual electroplating lines and complete, ready to use galvanic shops

Every project is developed and built according to specific guidelines and customer requests. We make sure that deliverables are in line with all of the clients’ requirements

Production of every electroplating line is guided by a set of technical specifications that are prepared together with the client and constitute an integral part of the contract.

# TAGAT’s coating equipment is designed for

*for galvanic and chemical coating*

- Satin nickel plating
- Triple chrome plating: copper, nickel and chrome
- Nickel plating
- Chrome plating
- Zinc plating
- Cadmium plating
- Tin plating of steel parts
- Tin plating of copper and copper alloys
- Copper plating of steel parts
- Silver plating of copper and copper alloys
- Gold plating of copper and copper alloys
- Brass plating of steel parts
- Tin-lead alloy sedimentation (POS-40) cover of steel parts
- Tin-zinc alloy sedimentation cover of steel parts
- Passivating of tin-phosphor bronze parts
- Automatic line of nickel chemical coating of steel parts
- Automatic line of anodic oxide coating of aluminium and aluminium alloys
- Nickel-cobalt sedimentation cover of copper and copper alloys
- Deep anodic oxide coating of aluminium alloy parts
- Anodic oxide coating of electrical insulation parts made of aluminium and aluminium alloys
- Electrochemical oxide coating of aluminium and aluminium alloys
- Phosphating of steel parts
- Phosphate-oxide coating of parts
- Oxidation of steel parts
- Oxidation of copper and copper alloys
- Oxidation of magnesium alloys
- Electrochemical polishing of carbon and low-alloy steel parts
- Electrochemical polishing of silver coated parts

# Project’s technical description

## *1) Автоматизированная система управления технологическими процессами*

- 1.1 Основные функции системы управления
- 1.2 Визуализация общего состояния линии
- 1.3 Редактор технологических процессов
- 1.4 Контроль технологических процессов

## *2) Технологическое оборудование*

- 2.1 Технологические ванны
- 2.2 Система вентиляции
- 2.3 Системы технологических трубопроводов
- 2.4 Автооператоры

# 1) Automated technological processes' controls

Technological processes' control system is represented by individual components bound together in a unified chain of remote controls, data processing and storage units, elements for automation: sensors, control levers,

On a lower level controllers measure parameters of the technological process and control its performance while collecting data that is sent to the upper level.

Upper level comprises operation stations and servers that store archived data and the database for controllers' operational system. Operation stations are fitted with an interactive console displaying all current parameters of the technological process ensuring that the process is visualised by the operator in real time.

Controls system includes

*Hardware*

- Controllers
- Digital interface modules
- Operation stations and system servers
- Networks
- Operations control

*Software*

- Real time operational systems
- Means of development and execution of technological processes
- Data collection and operational controls system

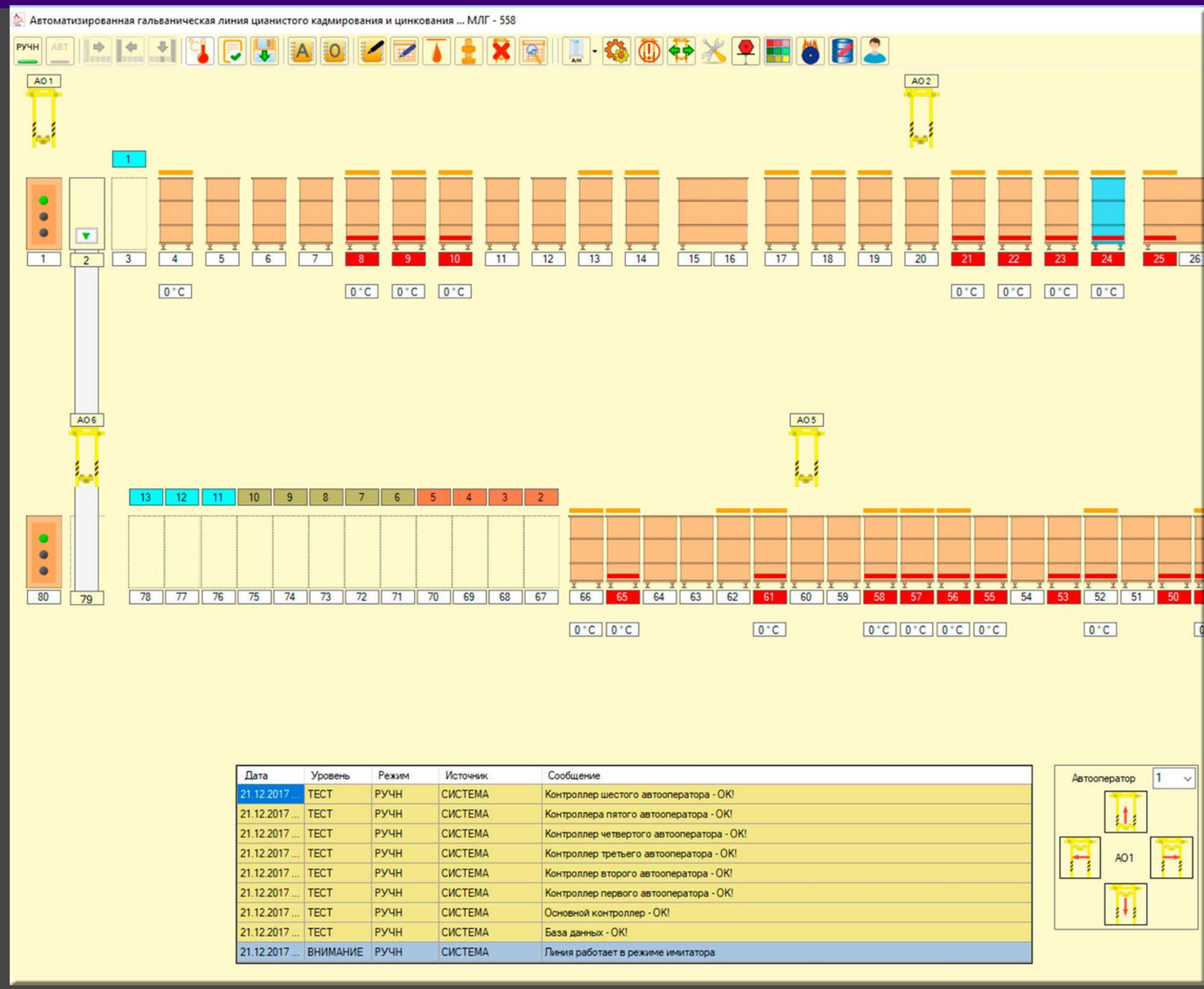
# 1.1 Main functions of controls system

1. Automated remote controls from operators’ workplace
2. System to identify emergencies combined with an alarm system, process parameters’ tracking in relation to maximum values, equipment failure tracking
3. Information from sensors is collected automatically and displayed at operators’ workplace on an interactive console
4. Registration of the controlled parameters , events, operator’s actions and their automatic recording into a database
5. Representation of data as trends, tables and graphs
6. Different levels of access for employees

# 1.2 Electroplating line visualisation

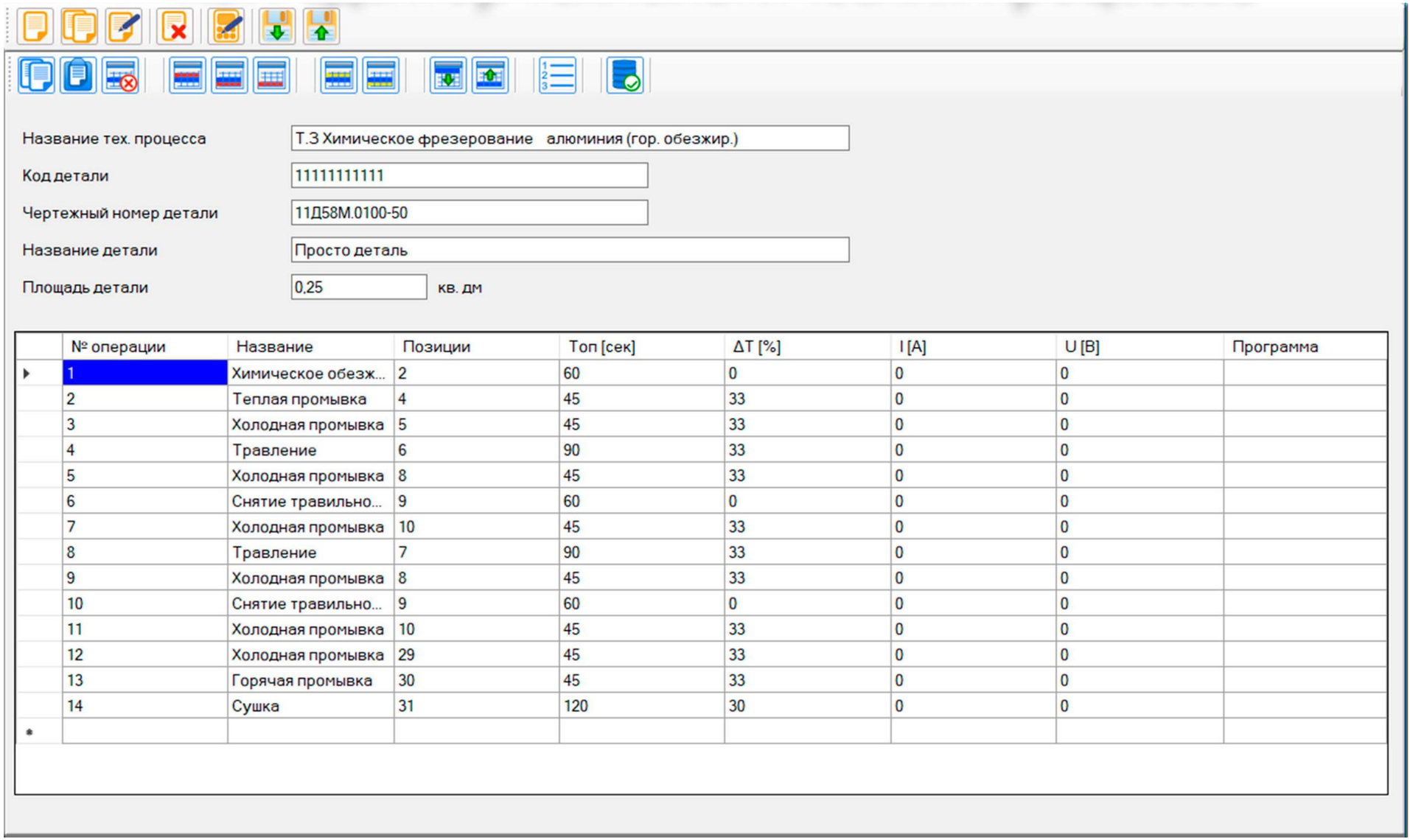
*Electroplating line visualisation window comprises of*

1. Exterior view of the line with the layout of technological positions and accounting for center-to-center spacing ratios
2. View of the numbered line components reflecting their real position in real time
3. Current technological parameters of relevant baths: temperature, pH, electric current voltage reflected on the graphs and trends
4. Main blockages and alarm messages for transport system as well as for the technological component
5. Settings of the technological parameters of the baths, suspensions and instruments for technological route creation



# 1.3 Technological processes' editor view

Individual settings of a technological process of the hard and flexible event timeline for every set of parts traceable to the system server



Название тех. процесса: Т.3 Химическое фрезерование алюминия (гор. обезжир.)

Код детали: 11111111111

Чертежный номер детали: 11Д58М.0100-50

Название детали: Просто деталь

Площадь детали: 0,25 кв. дм

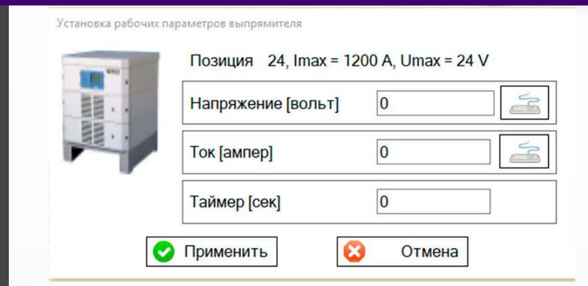
| № операции | Название | Позиции | Топ [сек] | ΔT [%] | I [A] | U [B] | Программа |
|---|---|---|---|---|---|---|---|
| 1 | Химическое обезж... | 2 | 60 | 0 | 0 | 0 | |
| 2 | Теплая промывка | 4 | 45 | 33 | 0 | 0 | |
| 3 | Холодная промывка | 5 | 45 | 33 | 0 | 0 | |
| 4 | Травление | 6 | 90 | 33 | 0 | 0 | |
| 5 | Холодная промывка | 8 | 45 | 33 | 0 | 0 | |
| 6 | Снятие травильно... | 9 | 60 | 0 | 0 | 0 | |
| 7 | Холодная промывка | 10 | 45 | 33 | 0 | 0 | |
| 8 | Травление | 7 | 90 | 33 | 0 | 0 | |
| 9 | Холодная промывка | 8 | 45 | 33 | 0 | 0 | |
| 10 | Снятие травильно... | 9 | 60 | 0 | 0 | 0 | |
| 11 | Холодная промывка | 10 | 45 | 33 | 0 | 0 | |
| 12 | Холодная промывка | 29 | 45 | 33 | 0 | 0 | |
| 13 | Горячая промывка | 30 | 45 | 33 | 0 | 0 | |
| 14 | Сушка | 31 | 120 | 30 | 0 | 0 | |

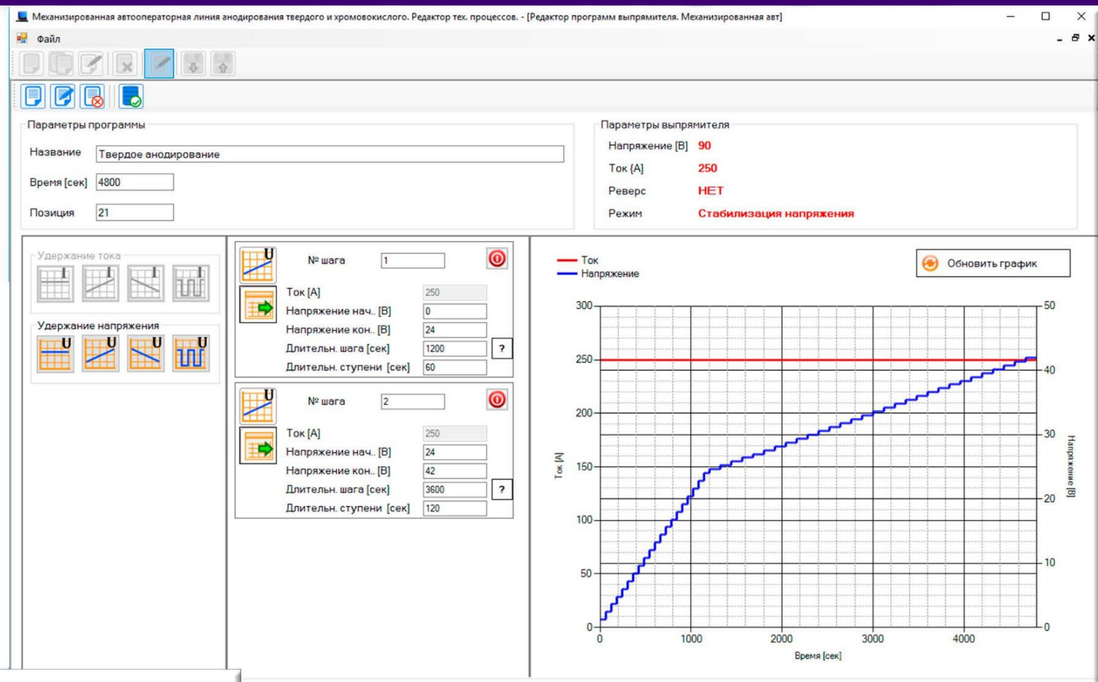
# 1.4 Technological processes' controls

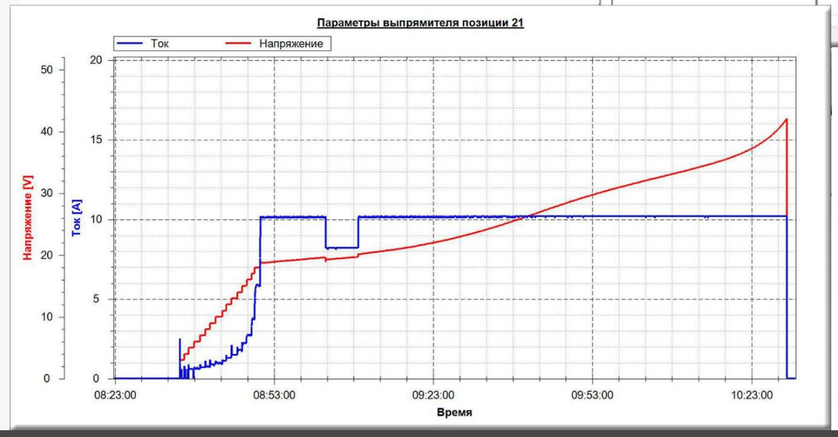
Rectifiers' (sources of current) programs editor allows for individual modes of operation with step by step electric current and voltage settings.

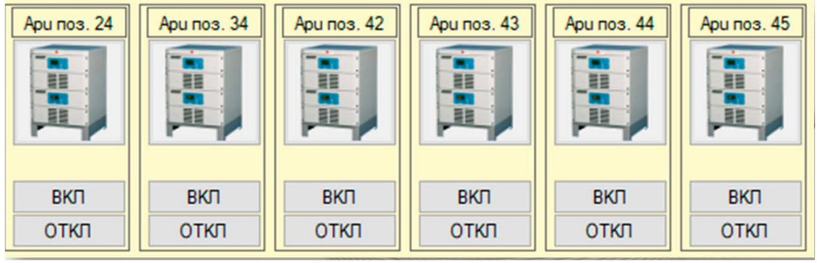
As well as allowing to save, load, edit previously created programs.

Real time monitoring along with time series graphs displaying rectifiers performance has been facilitated



# 1.4 Technological processes’ control

Make a one click button controlled detailed report of all technological parameters of the line (selected tech process, positions’ sequence, temperature, current, voltage, processing time)

| Дата | Уровень | Режим | Источник | Сообщение |
|---|---|---|---|---|
| 21.12.2017 ... | ИНФО | АВТО | АВТООПЕРАТОР | Начало переноса подвески № 1 с позиции 24 на позицию 36 |
| 21.12.2017 ... | ИНФО | АВТО | ВЫПРЯМИТЕЛЬ | Отключение APU поз.24 |
| 21.12.2017 ... | ИНФО | АВТО | ВЫПРЯМИТЕЛЬ | Старт программы APU поз.24 |
| 21.12.2017 ... | ИНФО | АВТО | АВТООПЕРАТОР | Конец переноса подвески № 1 с позиции 4 на позицию 24 |
| 21.12.2017 ... | ИНФО | АВТО | АВТООПЕРАТОР | Начало переноса подвески № 1 с позиции 4 на позицию 24 |
| 21.12.2017 ... | ИНФО | АВТО | АВТООПЕРАТОР | Конец переноса подвески № 1 с позиции 1 на позицию 4 |
| 21.12.2017 ... | ИНФО | АВТО | АВТООПЕРАТОР | Начало переноса подвески № 1 с позиции 1 на позицию 4 |
| 21.12.2017 ... | ИНФО | АВТО | АВТООПЕРАТОР | Начало переноса подвески № 1 с позиции 3 на позицию 1 |
| 21.12.2017 ... | ТЕСТ | РУЧН | СИСТЕМА | Контроллер шестого автооператора - OK! |

Отчет

Техпроцесс: ДЕТ000102 * Подготовка поверхности с удалением шлама

Дата: 20.12.2017 12:33:39

Индекс детали: ДЕТ000102

Покрываемая поверхность [кв.дм]: 2224

№ сопр. паспорта: 32568

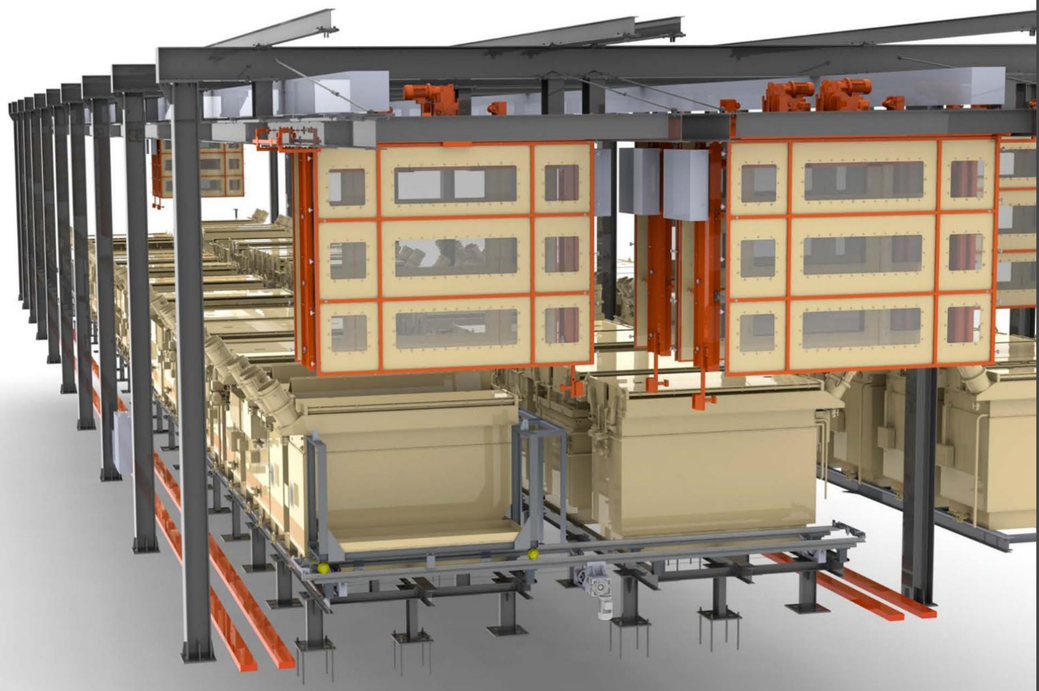
Оператор: Alex P. Voronin

| № п/п | № позиции | Операция | Ток [A] | Время обработки [сек] | Температура | Загрузка [шт] |
|---|---|---|---|---|---|---|
| 1 | 8 | Теплая промывка с душем | | 42 | | 1483 |
| 2 | 23 | Химическое обезжиривание | | 122 | | 1483 |
| 3 | 25 | Теплая промывка (каскад) | | 42 | | 1483 |
| 4 | 26 | Холодная промывка (каскад) | | 41 | | 1483 |
| 5 | 31 | Травление перед Zn, Cd | | 61 | | 1483 |
| 6 | 29 | Холодная промывка | | 41 | | 1483 |
| 7 | 30 | Холодная промывка с душем | | 41 | | 1483 |
| 8 | 34 | Удаление шлама | 1987 | 62 | | 1483 |
| 9 | 35 | Теплая промывка | | 42 | | 1483 |
| 10 | 20 | Холодная промывка с душем | | 42 | | 1483 |
| 11 | 8 | Теплая промывка с душем | | 42 | | 1483 |

# 2) Technological equipment

Depending on the size of baths two types of assembly solutions are employed: standard and compounded

Compounded assembly



Standard assembly automatic line

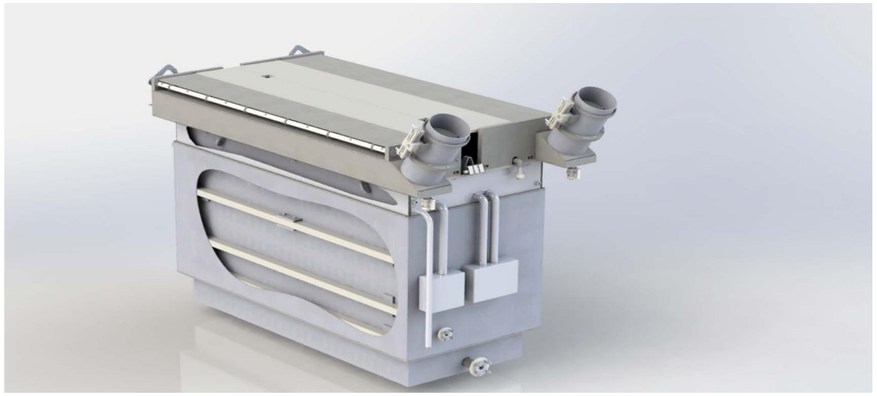
# 2.1 Technological baths

Baths are designed for main and supporting technological processes: protective, decorative and other types of coating.
Baths material is selected depending on its resistance to the components of the chemical solution.
TAGAT can make baths from a wide spectrum of materials, such as:

- Polypropylene
- Fluoropolymer
- Polyvinyl chloride (PVC)
- Stainless steel
- Titanium
- Carbon steel

Depending on the technological parameters of the process baths can be fitted with:

- Sideways suction ducts
- Covers fitted with suction ducts
- Devices for compressed air supply for mixing (bubbling technology)
- Tilting and shaking mechanism
- Cooling pipes
- Heating collector

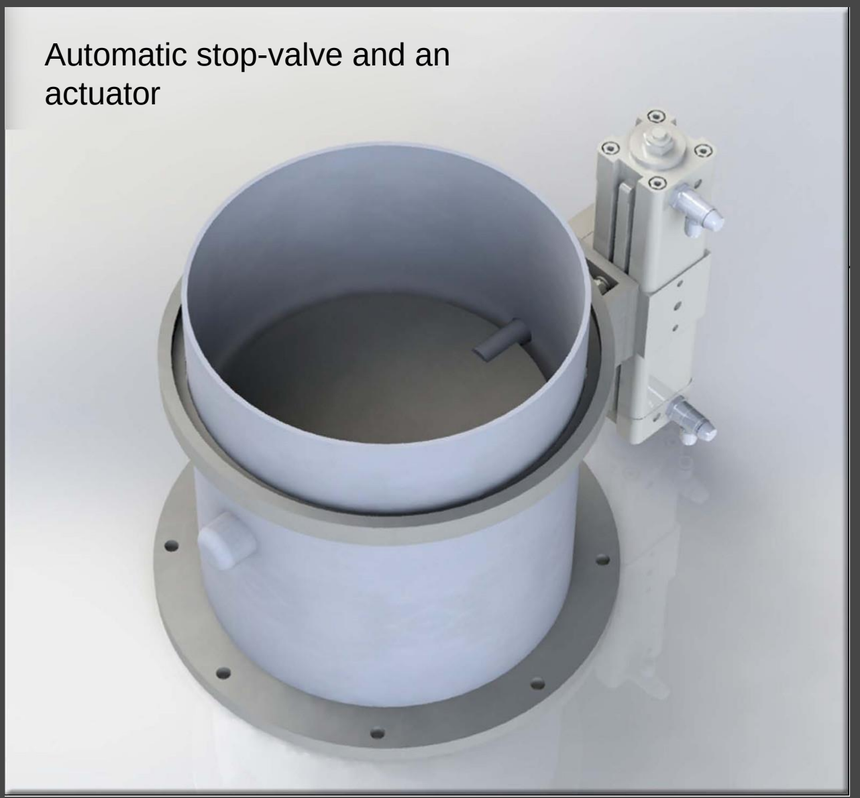


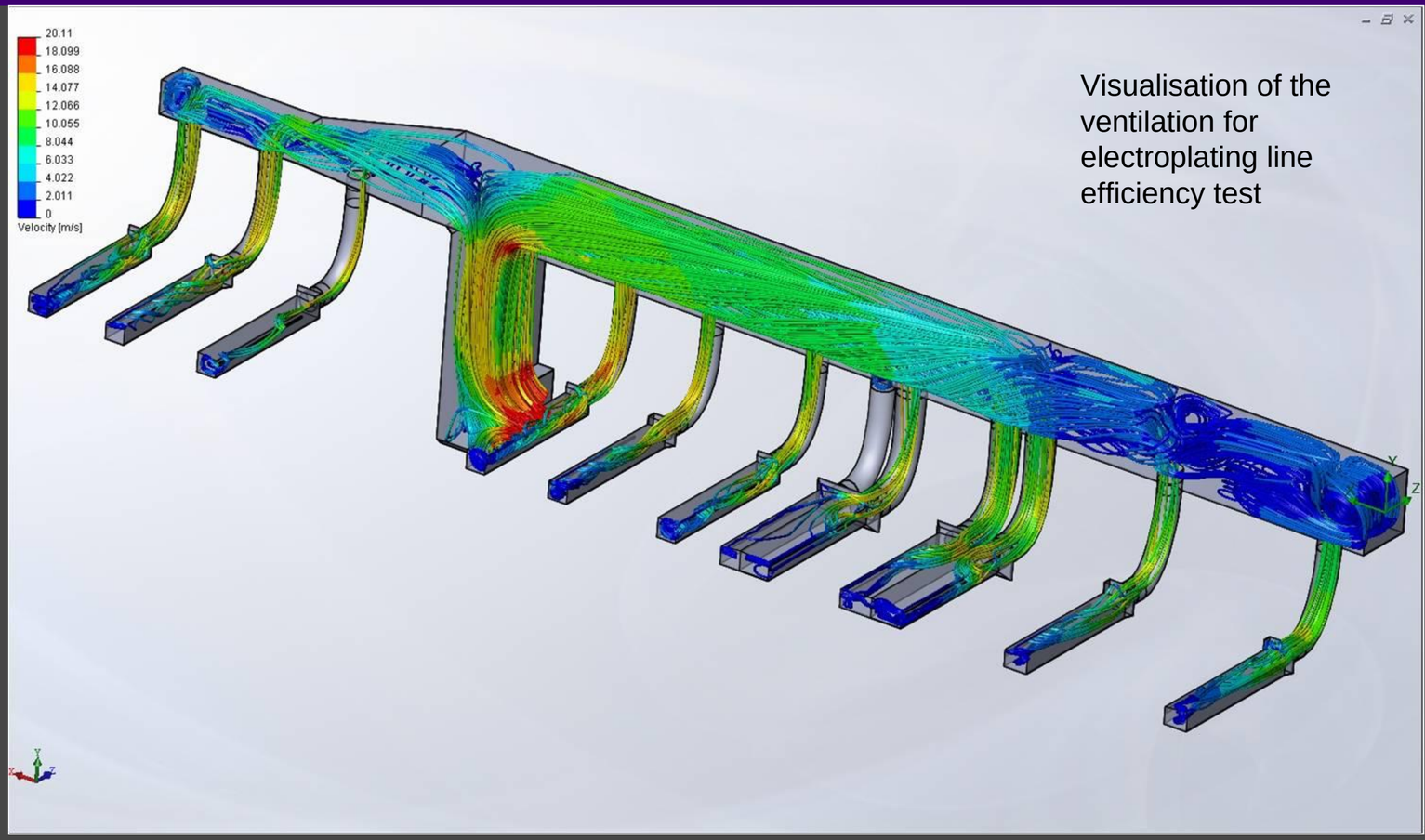
# 2.2 Ventilation system

Ventilation system is designed for creating and supporting set air characteristics indoors. Our enterprise can make ventilation systems for hazardous production facilities, smoke exhaust systems, harmful gases neutralisation

At the designing stage of the line necessary ventilation capacity calculations are being conducted and volumes of removed air and ventilation structure durability tested

Automatic stop-valve and an actuator



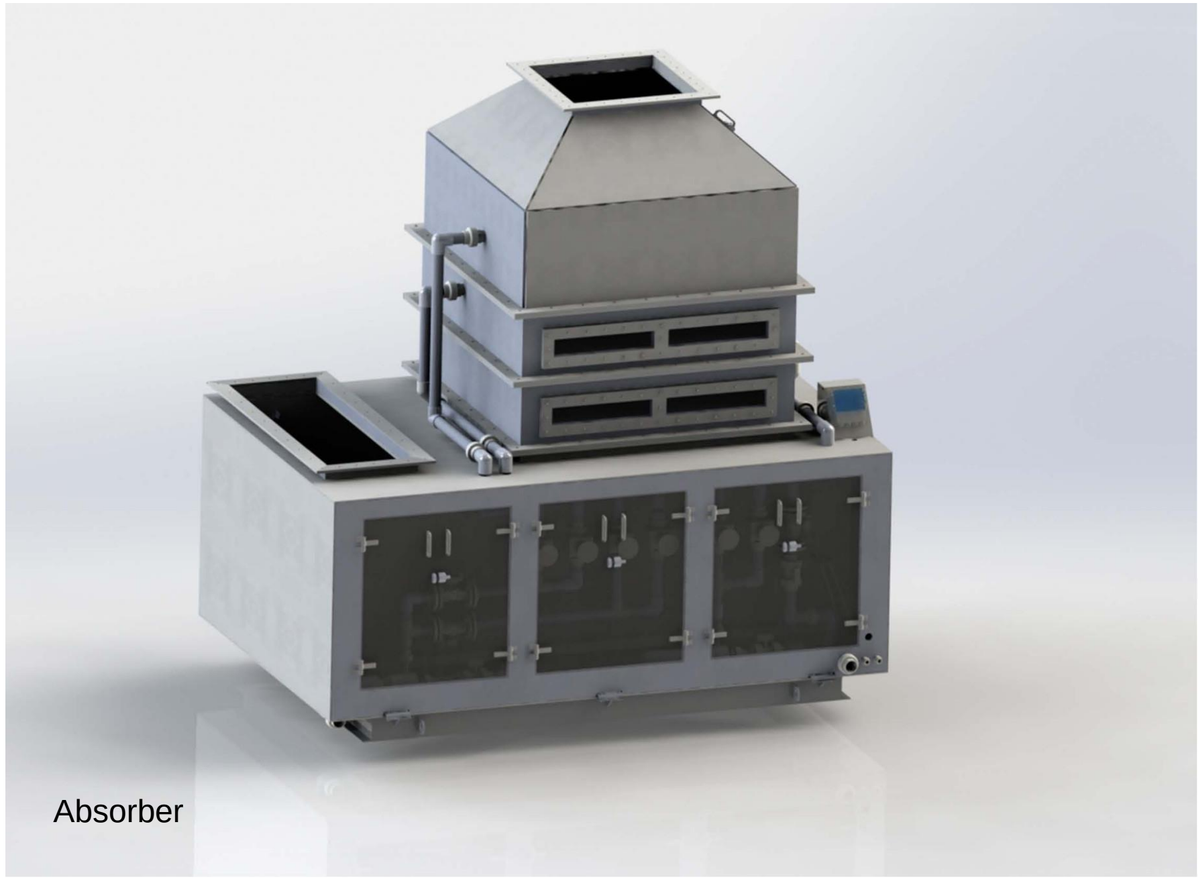



Visualisation of the ventilation for electroplating line efficiency test

Size and structures of suction ducts are designed for specific needs of every project. Rectangular-sectioned or circular-sectioned suction ducts can be manufactured

# 2.2 Ventilation system

To purify removed are a “foam absorber” is in use. Purified air is sent to a bubble unit with small holes (3-5mm) that is covered by a layer of liquid. At the air speed up to 2m/s the liquid becomes foamy. As a result almost 100% of particles larger than 5 microns are trapped



Absorber

# 2.3 Technological pipeline system

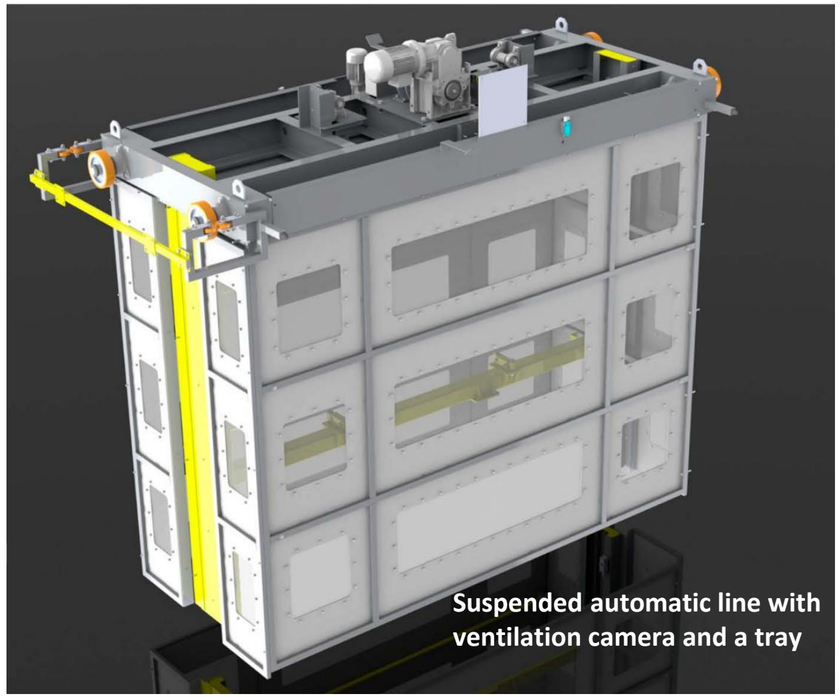

To reduce the electricity consumption automated technological process control system manages closure ties and regulation equipment, providing optimum operational mode

Pipelines for various systems (air, water) and those for acidic drains are made of the polymer materials and fittings made by FIP and GeorgFischer and have a direction of flow marking to be identified in accordance with Russian standard (GOST- 14202)

# 2.4 Automatic manipulators

Automatic manipulators are designed to transport parts on suspended lines and in drums to various electroplating and chemical treatment stages

Console automatic manipulator



Suspended automatic line with ventilation camera and a tray

Automatic electroplating lines control may be executed from operation station as well as from the line servicing platform

Automatic manipulators are made:

- Suspended for straight lines on a double rail
- Portal-framed for straight lines
- Suspended monorails for oval lines
- Console lateral for light-sized baths
- Suspended with ventilation camera and a tray
- Specialised

Пульт управления автооператором

# Ecological equipment

## *1. Complex of water treatment facilities for electroplating*

Wastewaters resulting from electroplating activities are known to include diluted drains (rinsing drains) and concentrated solutions (washing, degreasing, etching, cyanide and chrome containing electrolytes). Drain treatment complex is designed to remove heavy metals, part of anions, petroleum products, synthetic surface active substances, chemical supplements causing blockages that are contained in the rinsing drains or baths complex

### *List elements of a typical set of wastewater treatment equipment*

- Drains' storage containers
- Reactors for neutralising acidic and toxic stocks
- Cesspits
- Filter-presses
- Ion exchange columns
- Osmosis multilayer installation
- Control system
- Automated high energy efficiency controls system with a crystallizer to remove dry deposits

# Ecological equipment

Water treatment system of the electroplating enterprise works in a closed loop and without water disposal into factory’s sewage system. At the same time there is an emergency mode operation sequence where drains that meet environmental standards are disposed off into the sewage

Our products are based on the newest technologies available and tested industrial water treatment methods that fully meet the ecological requirements and norms set by the state

Our task is to make sure our clients’ enterprise has excellent water treatment facilities in shortest possible time with minimal expenses on our clients’ behalf

# Ecological equipment

## *Supply volume*

Following technological nodes are part of the wastewater treatment system:

- Node 1: Node of drain accumulation of the technological equipment
- Node 2: Node for neutralising processed acidic, alkalite, containing ammonium, chrome and nitrite solutions
- Node 3: Node for processing chrome and nitrite containing rinsing waters
- Node 4: Node for preparing reagent solutions
- Node 5: Node for preparing reagent solutions for the rinsing drains node
- Node 6: Node for processing kadmium containing drains
- Node 7: Node for obtaining, mixing and averaging drains
- Node 8: Node for depositing, collection and dewatering of the residue, collection of filtrate
- Node 9: Node for filtration on mechanical, sand and absorbent filters
- Node 10: Node for desalination (reverse osmosis membrane system)
- Node 11: Node for collection, disinfection and alkalinisation of purified water, accumulation and supply of category 2 water into manufacturing
- Node 12: Node for receiving, accumulating and supply of water of category 3 quality into manufacturing process
- Node 13: Node for 2 step eluate, concentrate and filtrate evaporation
- Node 14: Node for water treatment

# Ecological equipment

Delivery of the treatment facilities is executed on the “turnkey” basis - with connection to energy grid, water supply, sewage, ventilation provided by the customer

Electroplating shop operates double shifting mode

Complex of the treatment facilities constitutes multiple consecutive stages of pipelines, water pumps and closure and adjustment fitting, equipped with automatic system of technological processes’ control, including:

- Sensors for control and measurement of the technological parameters
- Secondary equipment and programmable controllers
- Regulatory final control devices with electro and pneumo drive
- Alarm sensors to notify of technological process exceeding limit values
- Visualised control and measurement equipment

# Ecological equipment

1.1 Treatment facilities provide
a) Purification of the wastewater from:

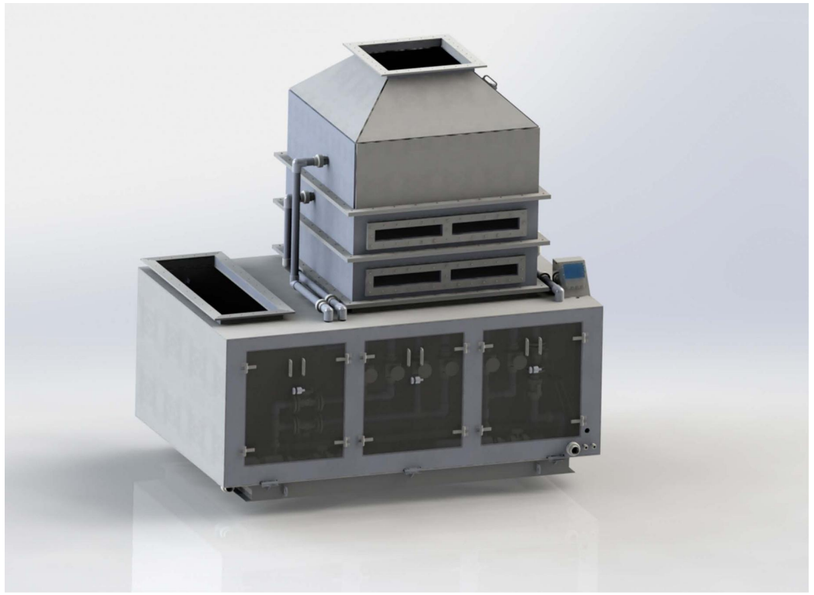
- Technological equipment (rinsing and spent solutions)
- Gas cleaning systems of  supply and exhaust ventilation
- Floor cleaning in the production facilities

b) provision of water category 2 and 3 in accordance with GOST 9.314-90 standard

c) Work of a closed loop and without water disposal into factory’s sewage system while providing water quality in accordance with GOST 9.314-90. 70% of this water can be reused in the electroplating process. There is also an emergency mode operation sequence where drains up to category 3 according to GOST 9.314-90 are disposed off into the sewage
d) Possibility to reduce the environmental danger level of the precipitation by significantly reducing the chance of dangerous metal deposits (nickel, zinc, chrome, copper) into precipitation
e) Maximum dewatering of the precipitation formed

# Ecological equipment

Set of treatment facilities



Gas filtering equipment
Absorbers (scrubbers) for wet gas cleaning

**We move forward and beyond what has already been achieved, introduce innovative technologies, use newest equipment and machinery taking great care of the high quality of electroplating and environmental protection technology**

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# Thank you!

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