



Scientific and Manufacturing Enterprise  
DNEPROENERGOSTAL LTD.

# **CATALOGUE OF EQUIPMENT AND SERVICES**

ZAPOROZHYE  
2009

# CONTENTS

Introduction	3
Pulse-Jet Baghouses (FRIR)	4
Magnetically-Driven Shaker Baghouses (FREMIR)	53
Retrofitting Electric Filters into Baghouses	60
Water Treatment Facilities	62
Key Competences in Environmental Audit and Standardization	65
Design	66
Disinfection of Drinking Water and Utility Fluids	67
Environmental Monitoring	68
Bioengineering Structures	70
Questionnaire	72
Services	73



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# INTRODUCTION

Scientific and Manufacturing Enterprise DNEPROENERGOSTAL LTD. is one of the leading companies in Ukrainian and CIS market of ecological services. For over 40 years we help industrial enterprises to solve their environment protection problems.

Our wide scope of activities covers production of gas and water treatment facilities, design, start-up and adjustment of gas and water treatment facilities, turnkey engineering services including personnel training and maintenance, recycling of recoverable utilities and environmental monitoring. We manufacture both serial and customized facilities based on individual projects.

Our process solutions are intended to improve not only environmental conditions of industrial enterprise but its economic performance as well due to recoverable material or energy resources and their recycling.

This catalogue presents our main environmental protection services including protection of air and water basins, recycling of recoverable energy resources and environmental monitoring services.

Pulse-jet baghouses and magnetically-driven shaker baghouses are used as the basis for this Catalogue. Here the main product range, as well as design features, technical characteristics and overall dimensions of the baghouses are represented. The baghouses may be used for treatment of aspiration air and dust laden process gases in many industrial fields.

This edition substitutes the catalogue version published in 2005. It includes new developments of our experts and revisions made in technical characteristics of the baghouses, based on our long-term experience of their operation in different production conditions.

In case you are interested in our products, please send an order letter with filled questionnaire to the address specified in the Catalogue.

We are always available for mutually beneficial cooperation.

## PULSE-JET BAGHOUSES (FRIR)

Filtration is the most efficient method to entrap fine dust from off-gases and aspiration emissions from various processes and equipment. In the course of the process, gases pass through fabrics with different characteristics used as filtering materials.

Fabric filters are widely used in iron and steel and non-ferrous production, chemical and petroleum industry, building materials production and other fields of the national economy.

In detailed view, baghouse is a metal body having bag filters therein. The bag filter comprises fabric bags put on metal wire frameworks.

For bag filter cleaning, pulse-jet blowing with compressed air through quick-responding blow-down valves is used. Dust may be discharged through flaps, rotary valves or through pneumatic conveying system manufactured and supplied at Customer's request. Pneumatic or shaking shattering system may also be installed to remove dust collected in the hopper to prevent from dust caking.

Our experts continue working to increase the efficiency and reliability of the equipment, improve its design, retrofit individual elements, using new filtering materials with high dust-holding capacity, resistant to high temperatures and corrosive media. Proposed dust collectors are highly competitive to similar foreign equipment and have some better characteristics, being more cost-efficient at the same time.

Various fabric dust collectors basically differ in cleaning method, design of filter elements (bags or cartridges), number of sections in the filter, filtering and cleaning modes.

Gas dedusting efficiency of the baghouse depends on dust particle size, characteristics of filtering cloth, method and mode of filter cleaning, specific gas and dust load, flow resistance of the unit.

The baghouses are equipped with a highly-efficient and reliable compressed air cleaning system using quick-responding blow-down valves. The unit operation is fully automated.

Instrumentation and automation system measures all the necessary process parameters and provides automated control of cleaning system, dust discharge system, system of temperature decrease at baghouse outlet, etc.

We apply various electronics to ensure cleaning system operation. At Customer's request, we may use SIEMENS SIMATIC controllers, Zelio Logic modules, special-purpose automated cleaning control module of BAUR-series. BAUR module is based on the up-to-date hardware components using programmable microcontrollers and meets all the requirements for cleaning system operation. As we do not use mechanical controls, this sufficiently increases service reliability of the device. Device setting and operation doesn't require any additional competency in electronics and programming.

Pulse-jet baghouses (FRIR) are intended to remove fine dust from process gases and aspiration emissions. The baghouses may be applied in any industrial field, where the process provides generation of dust-laden gases or air.

The baghouse comprises housing and mechanical equipment. The housing is a bearing structure. It is divided into clean gas compartment and dirty gas compartment by horizontal partition plates – bag hold-up plates with holes for filter bags attachment. Filter bags are located in the dirty gas compartment. They have a one-side attachment, from the clean gas compartment.

Removable lids are provided in the upper part of clean gas compartment for access to bags in maintenance. The dirty gas compartment is a single section without any partitions.

Clean gas compartment is divided into sections by vertical partition plates. The number of such plates corresponds to the number of cut-off valves (in case if the baghouse is equipped with cut-off valves). Common clean gas outlet is provided.

Pyramid or slotted hoppers make up the bottom part of the housing. The hoppers end with flanges to receive rotary feeders or screw conveyors.

At customer's request, a pneumatic conveying system for entrapped dust and pneumatic shattering system for dust collected in the hopper may be provided.

Other requirements for baghouse housing design shall be determined in detailed engineering for dust collector construction. With this, at the design stage, calculations should be made to check housing strength considering filtration process conditions and climatic and seismic loads in the region of unit erection. Corresponding revisions should be made in design documentation for production of the housing and baghouse enclosure ("roof").

Baghouse mechanical outfit comprises: bag cleaning system (compressed air collectors, blow-down valves and distributing headers); bag plates, filtering bags, wire frameworks, compressed air reduction unit, dust removal units and filter cleaning control cabinet.

FRIR baghouses with a capacity of up to 3000 m<sup>3</sup>/h are equipped with a cleaning system with DN 50 mm blow-down valves. Baghouses of a medium and high capacity (over 3000 m<sup>3</sup>/h) are equipped with DN 70 mm valves. Baghouses are cleaned automatically, after the preset value of bag filter flow resistance is attained. Bag cleaning is possible in a cyclic mode through preset time intervals. When cut-off valves are installed on the baghouse clean side, automated control system provides bag cleaning modes with or without cutting off clean gas flow.

Cloth with various physical properties manufactured by domestic or foreign companies may be used as a filtering cloth. The cloth is selected based on characterizes of gas and dust flow, primarily, on temperature conditions of filtration.

Compressed air pressure required for cleaning system operation in dust collector is 0.4 – 0.5 MPa. Compressed air should be dry and clean not below 10 Class in accordance with GOST 17433-80.

Baghouse size, fabric type, its configuration, outfit and climatic version are determined in development of Detailed Engineering for gas treatment facility, only based on customer's questionnaire, containing full information about dust and gas flow parameters and dust properties.

The catalogue includes basic technical characteristics of the equipment provided for input dust content equal to 10g/m<sup>3</sup>, max; temperature of gases to be cleaned is 135°C, max. Recommended maximum gas load on fiber for the above conditions is 1.5 m/m<sup>2</sup> x min.

If actual conditions of equipment operation deviate from the specified conditions, you are required to agree the installation of any baghouse size with the manufacturer.

We are ready to consider any wishes of our customers regarding the change of equipment design and its application in non-standard processes. Once we obtain your questionnaire, we'll offer you an optimum gas cleaning system utilizing the given or alternative equipment. When signing a contract, questions regarding field supervision, adjustment and warranty maintenance shall be viewed individually.

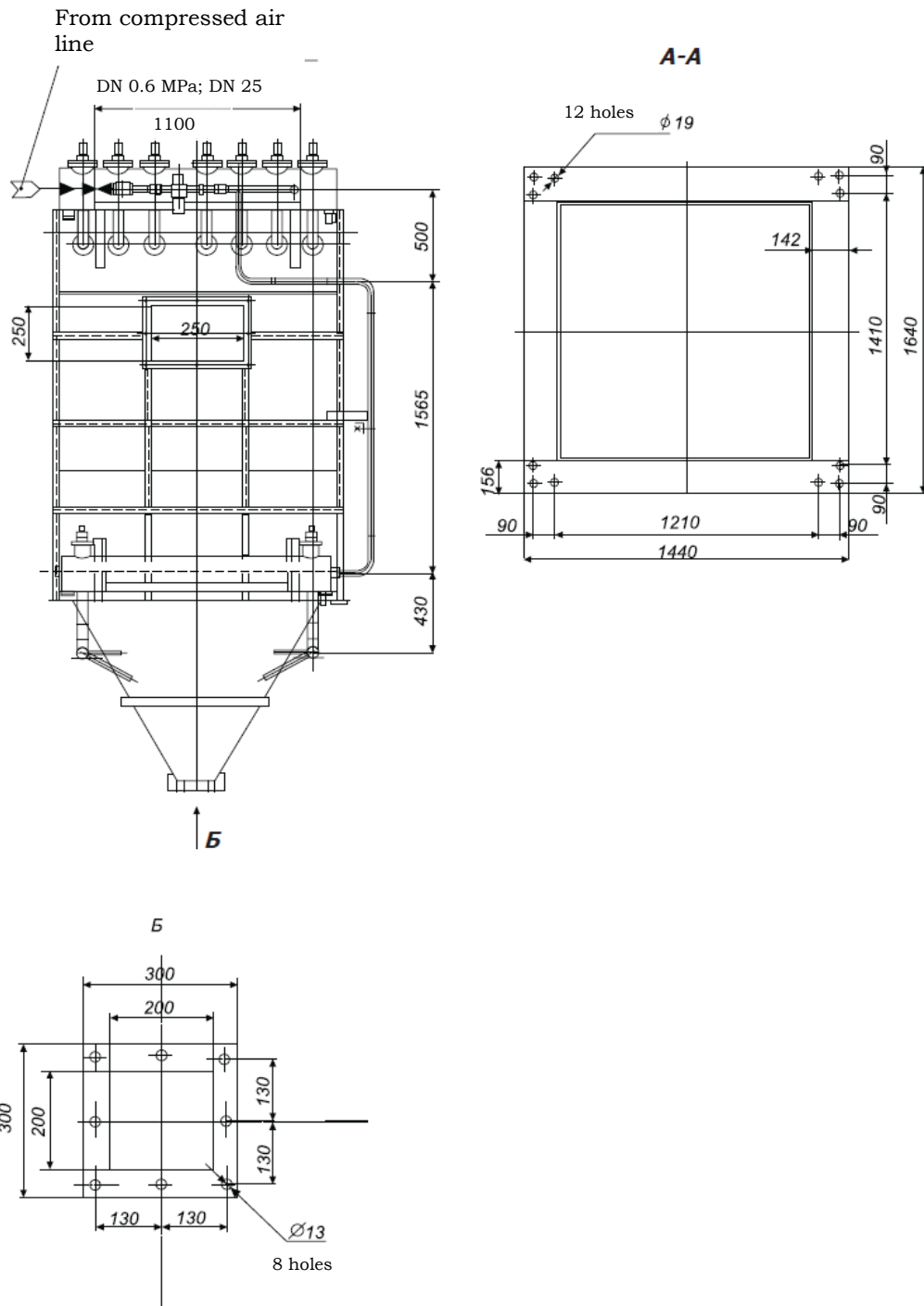
As an example, some filters represented in the Catalogue are equipped with pneumatic dust shattering system, heat-insulating shells, etc.

Final dust content is guaranteed to be 20 mg/m<sup>3</sup>, max under the specified parameters of dust and gas flow.

Filter conventional designation:

FRIR – pulse-jet baghouse; numbers after letters specify the filtering area (m<sup>2</sup>).

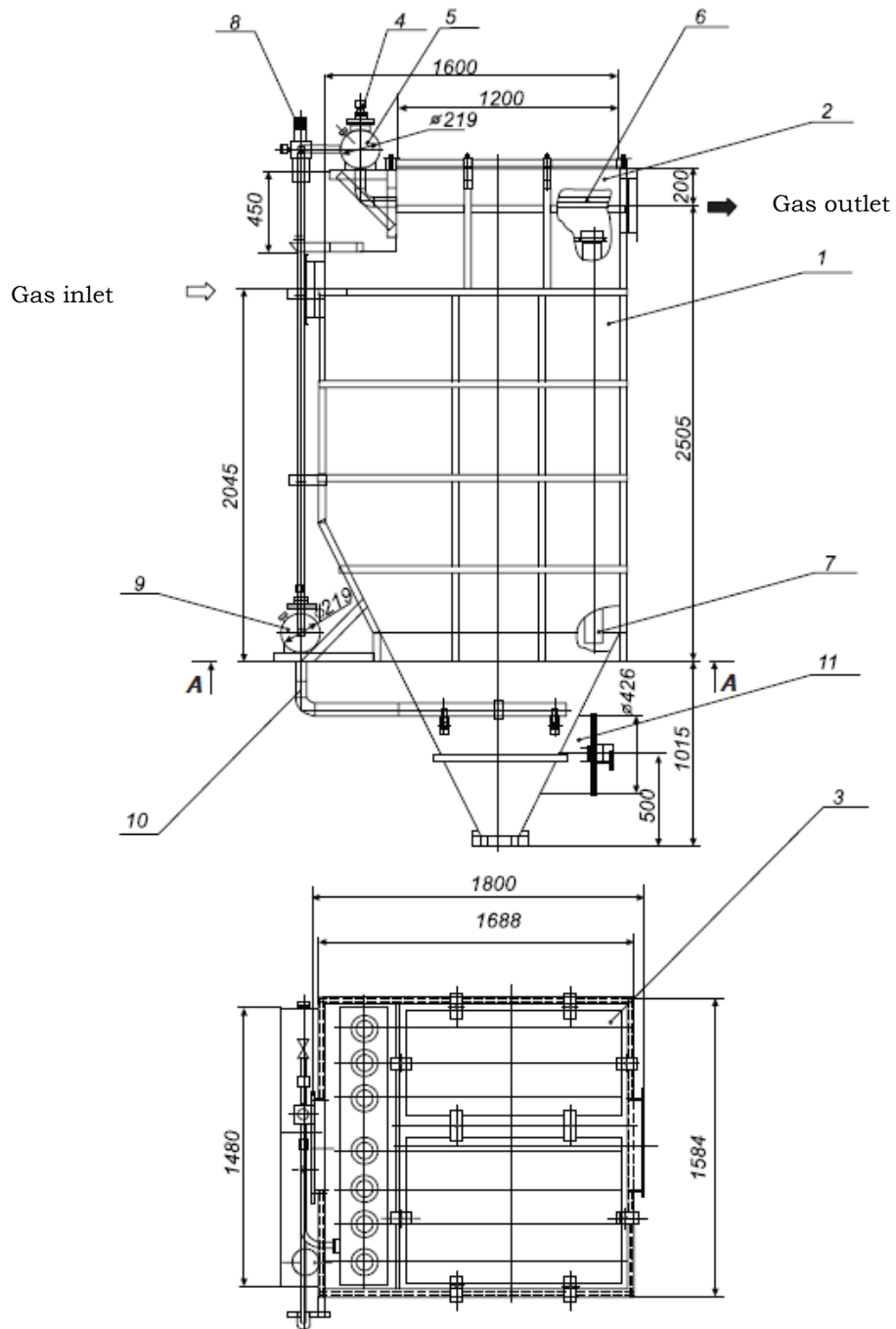




### Technical Characteristics

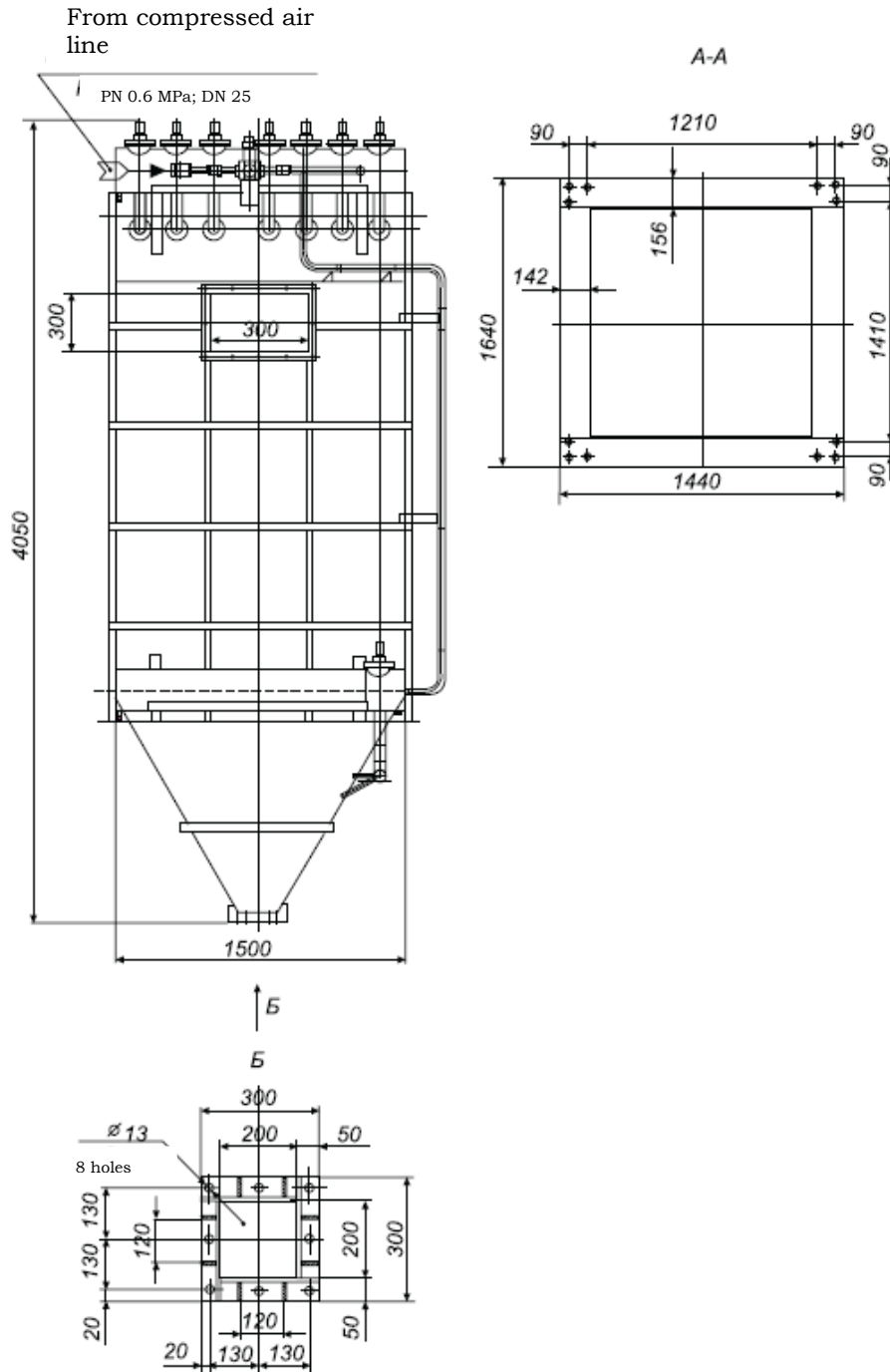
1. Gas feed rate, m <sup>3</sup> /h	up to 2 400
2. Filtering area, m <sup>2</sup>	<b>26.5</b>
3. Number of bag filters, pcs	<b>42</b>
4. Bag filter length, m	<b>1.54</b>
5. Baghouse mass, t	<b>1.36</b>
6. Compressed air flow rate, nm <sup>3</sup> /min, max	up to 2.4

# FRIR - 36



## Baghouse Components

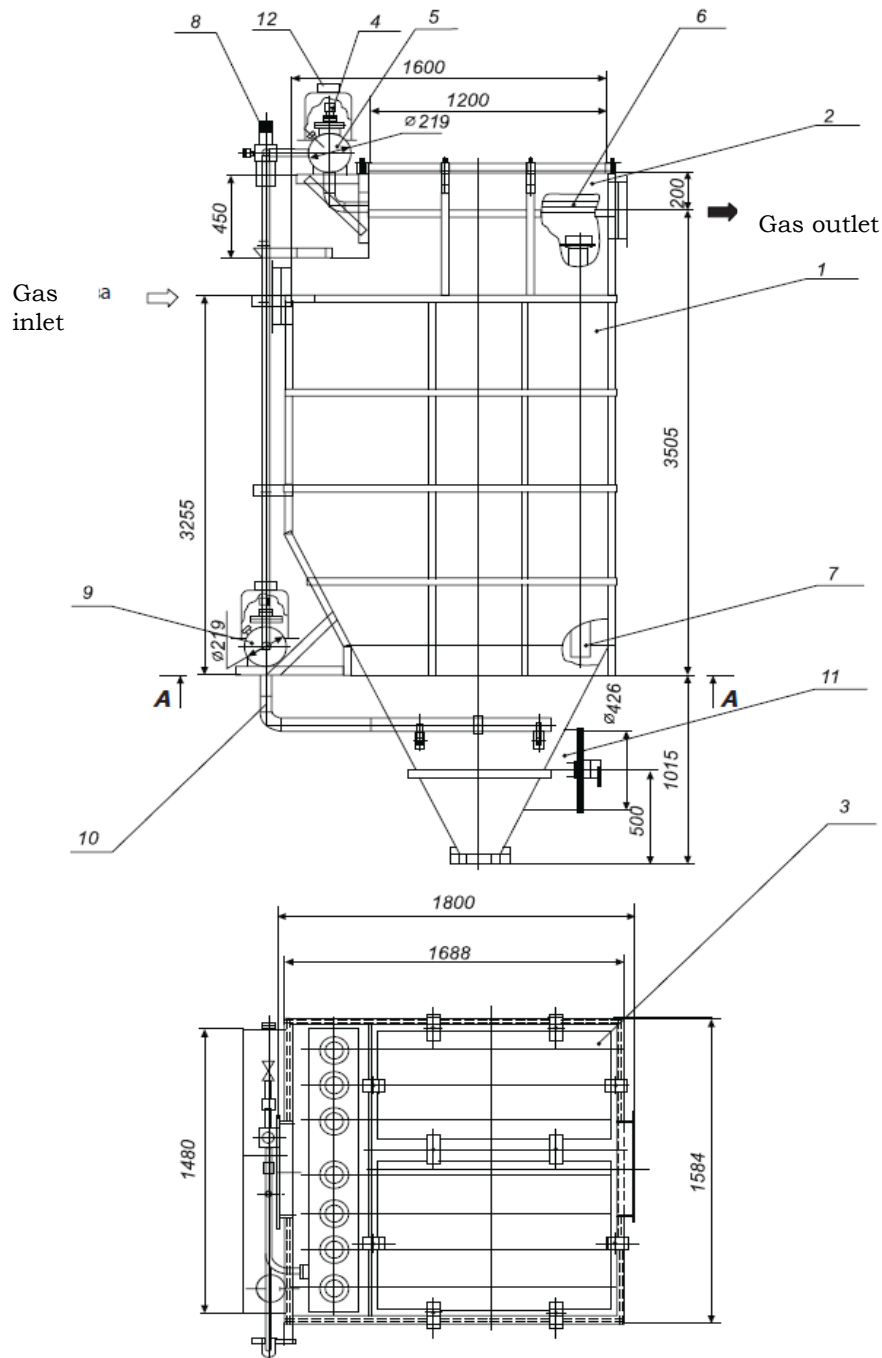
- |                             |  |
|-----------------------------|--|
| 1. Housing                  | 7. Bag filter                                |
| 2. Clean gas compartment    | 8. Compressed air reduction system           |
| 3. Lid                      | 9. Dust shattering system                    |
| 4. Blow-down valve          | 10. Dust shattering compressed air collector |
| 5. Compressed air collector | 11. Hatch                                    |
| 6. Distributing header      |  |



### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h	up to 3240
2. Filtering area, m <sup>2</sup>	36
3. Number of bag filters, pcs	42
4. Bag filter length, m	2.14
5. Baghouse mass, t	1.65
6. Compressed air flow rate, nm <sup>3</sup> /min , max	up to 2.4

# FRIR - 54

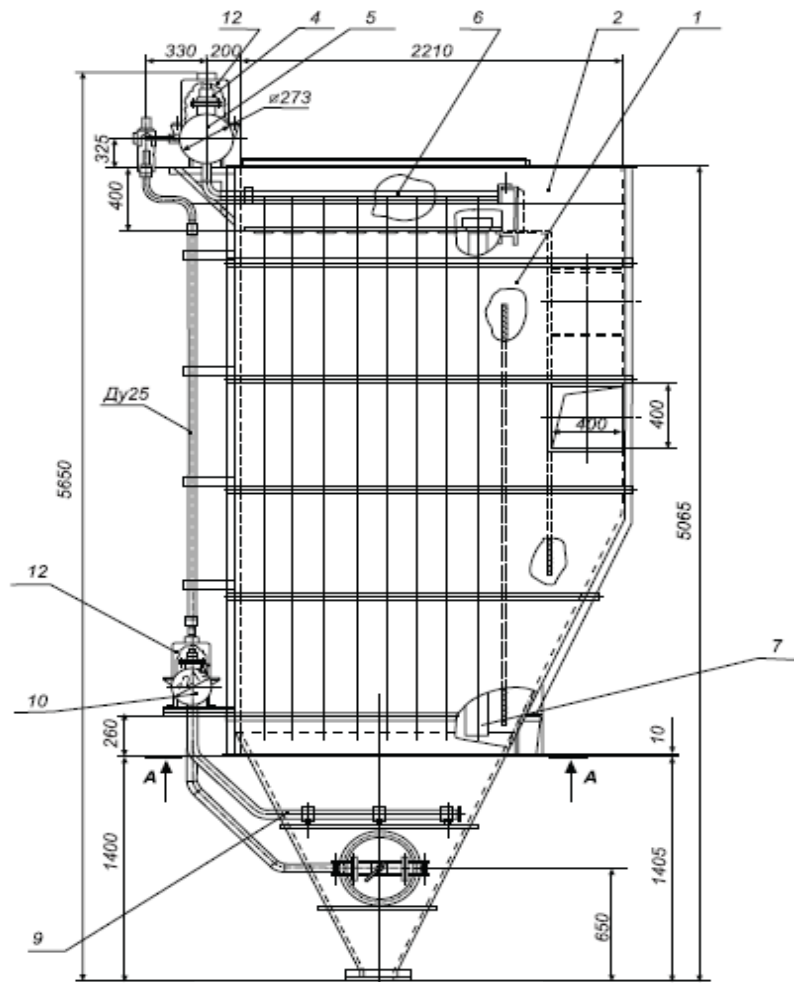


### Baghouse Components

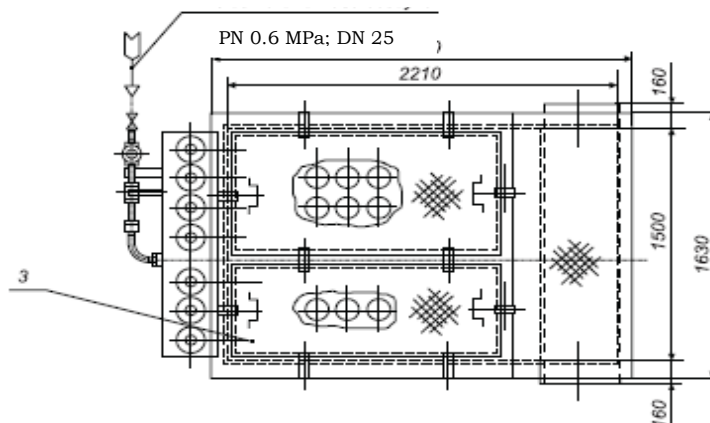
- |                             |  |
|-----------------------------|--|
| 1. Housing                  | 7. Bag filter                                |
| 2. Clean gas compartment    | 8. Compressed air reduction system           |
| 3. Lid                      | 9. Dust shattering system                    |
| 4. Blow-down valve          | 10. Compressed dust shattering air collector |
| 5. Compressed air collector | 11. Hatch                                    |
| 6. Distributing header      | 12. Heat-insulating shell                    |



# FRIR - 70

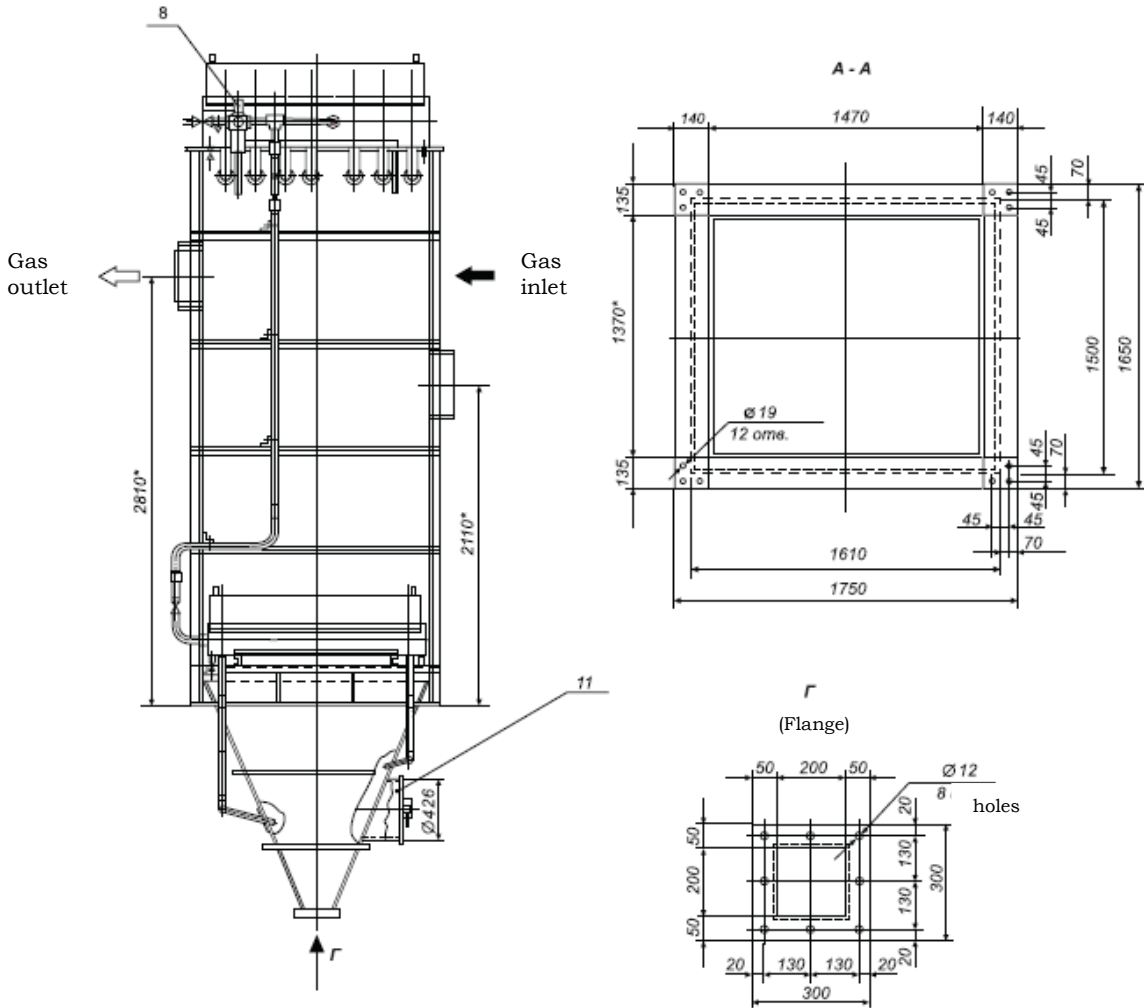


From compressed air line



## Baghouse Components

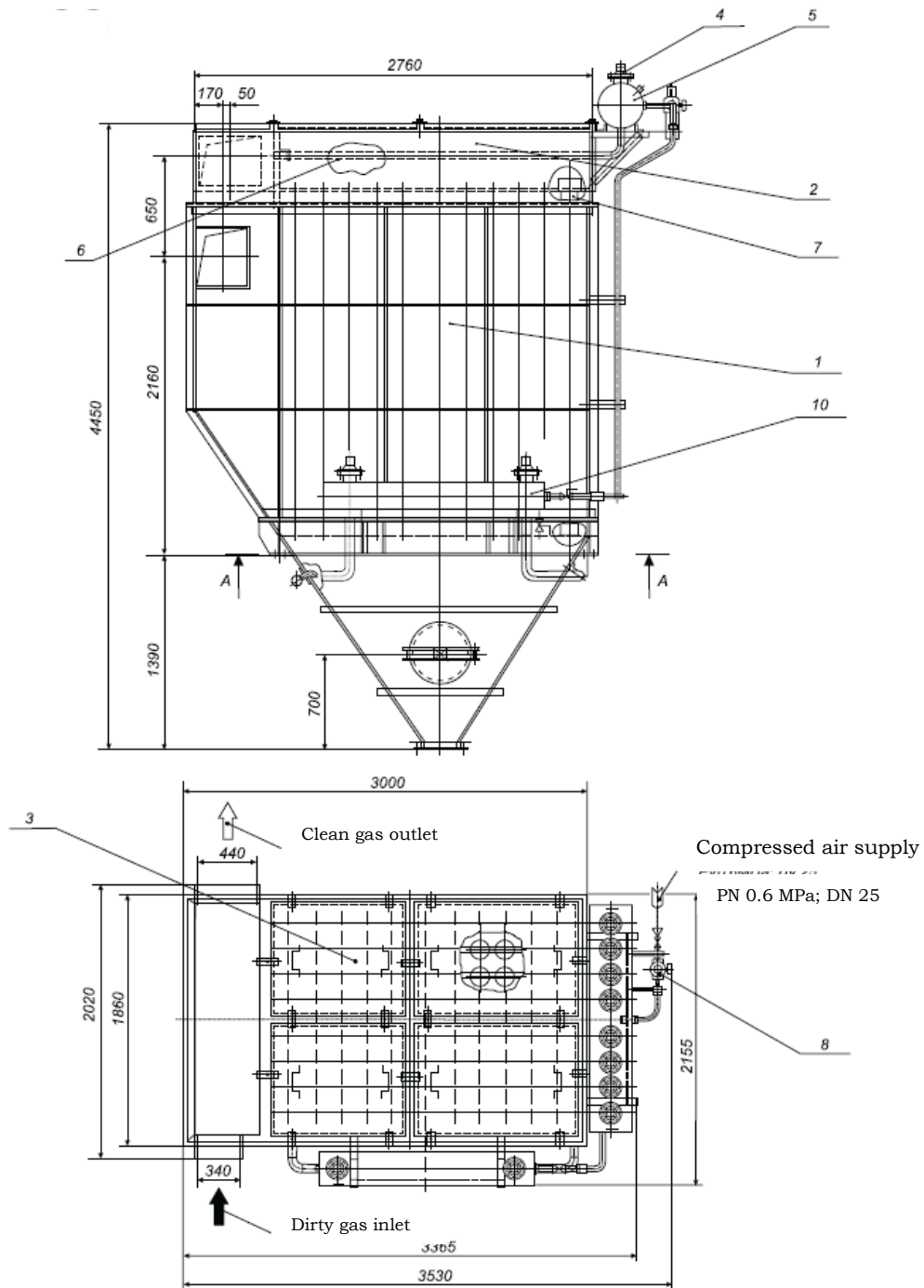
- |                             |  |
|-----------------------------|--|
| 1. Housing                  | 7. Bag filter                                |
| 2. Clean gas compartment    | 8. Compressed air reduction system           |
| 3. Lid                      | 9. Dust shattering system                    |
| 4. Blow-down valve          | 10. Compressed dust shattering air collector |
| 5. Compressed air collector | 11. Hatch                                    |
| 6. Distributing header      | 12. Heat-insulating shell                    |



### Technical Characteristics

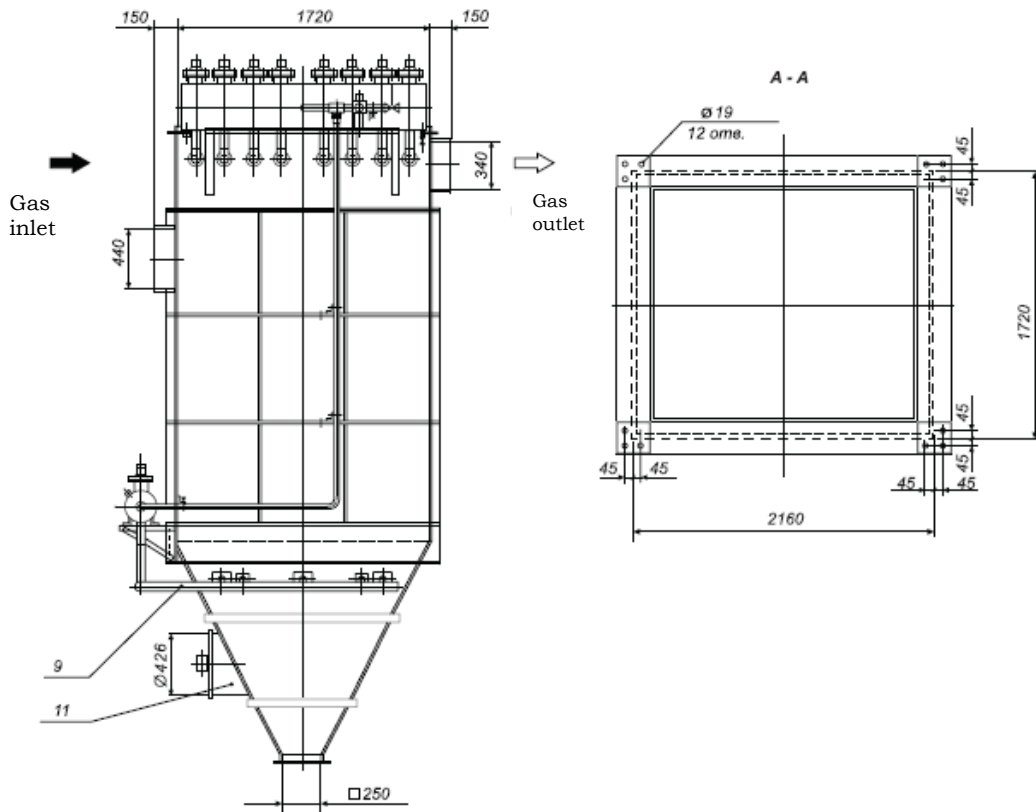
1. Gas feed rate, m <sup>3</sup> /h	up to 7000
2. Filtering area, m <sup>2</sup>	74
3. Number of bag filters, pcs	56
4. Bag filter length, m	3.14
5. Baghouse mass, t	2.46
6. Compressed air flow rate, nm <sup>3</sup> /min, max	up to 2.4

# FRIR - 90



### Baghouse Components

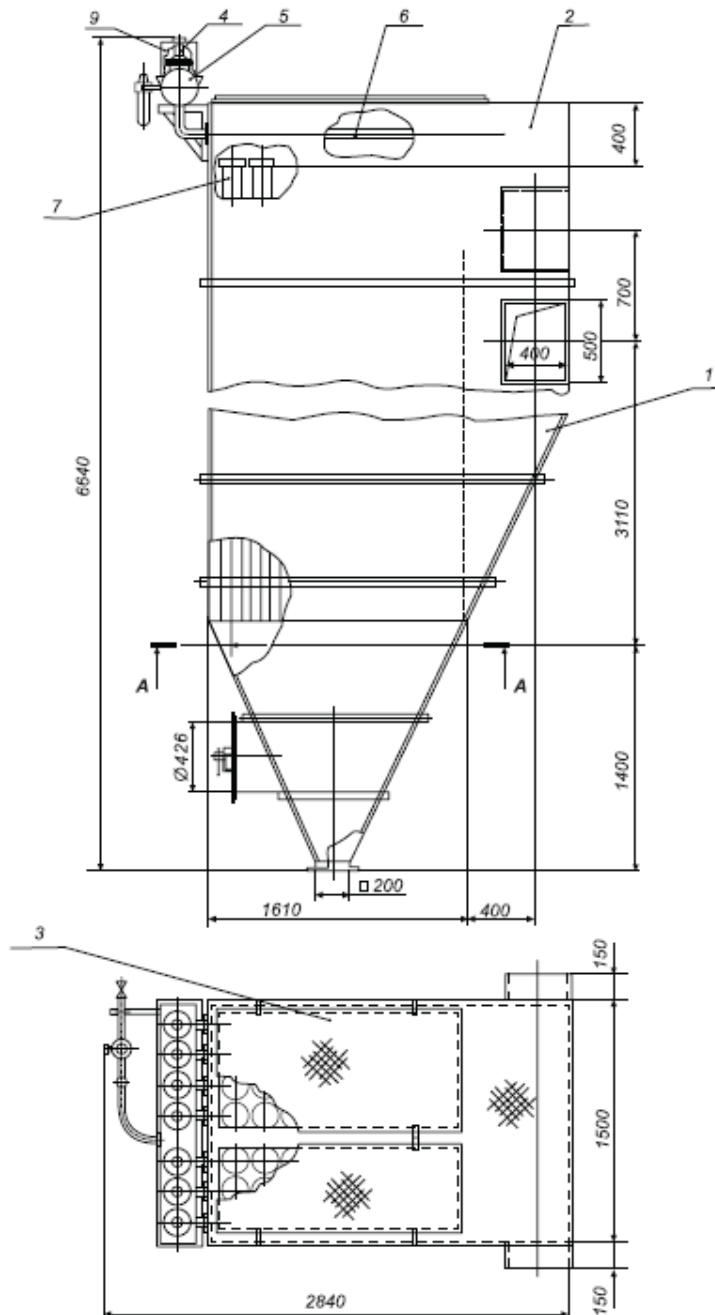
- |                             |   |
|-----------------------------|---|
| 1. Housing                  | 7. Bag filter                                     |
| 2. Clean gas compartment    | 8. Compressed air reduction system                |
| 3. Lid                      | 9. Dust shattering system                         |
| 4. Blow-down valve          | 10. Pneumatic shattering compressed air collector |
| 5. Compressed air collector | 11. Hatch   |
| 6. Distributing header      |   |



### Technical Characteristics

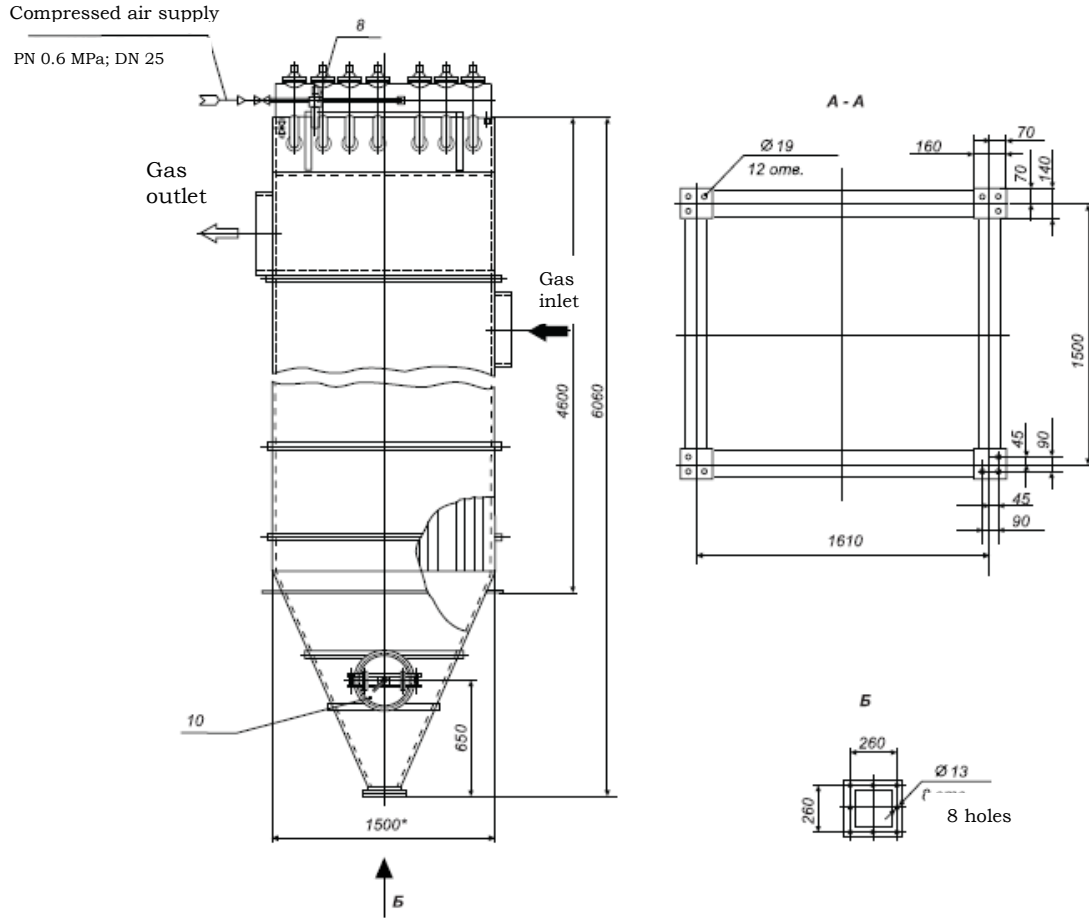
1. Gas feed rate, m <sup>3</sup> /h	up to 8300
2. Filtering area, m <sup>2</sup>	92
3. Number of bag filters, pcs	88
4. Bag filter length, m	2.4
5. Baghouse mass, t	3.2
6. Compressed air flow rate, nm <sup>3</sup> /min, max	2.4

# FRIR – 100



### Baghouse Components

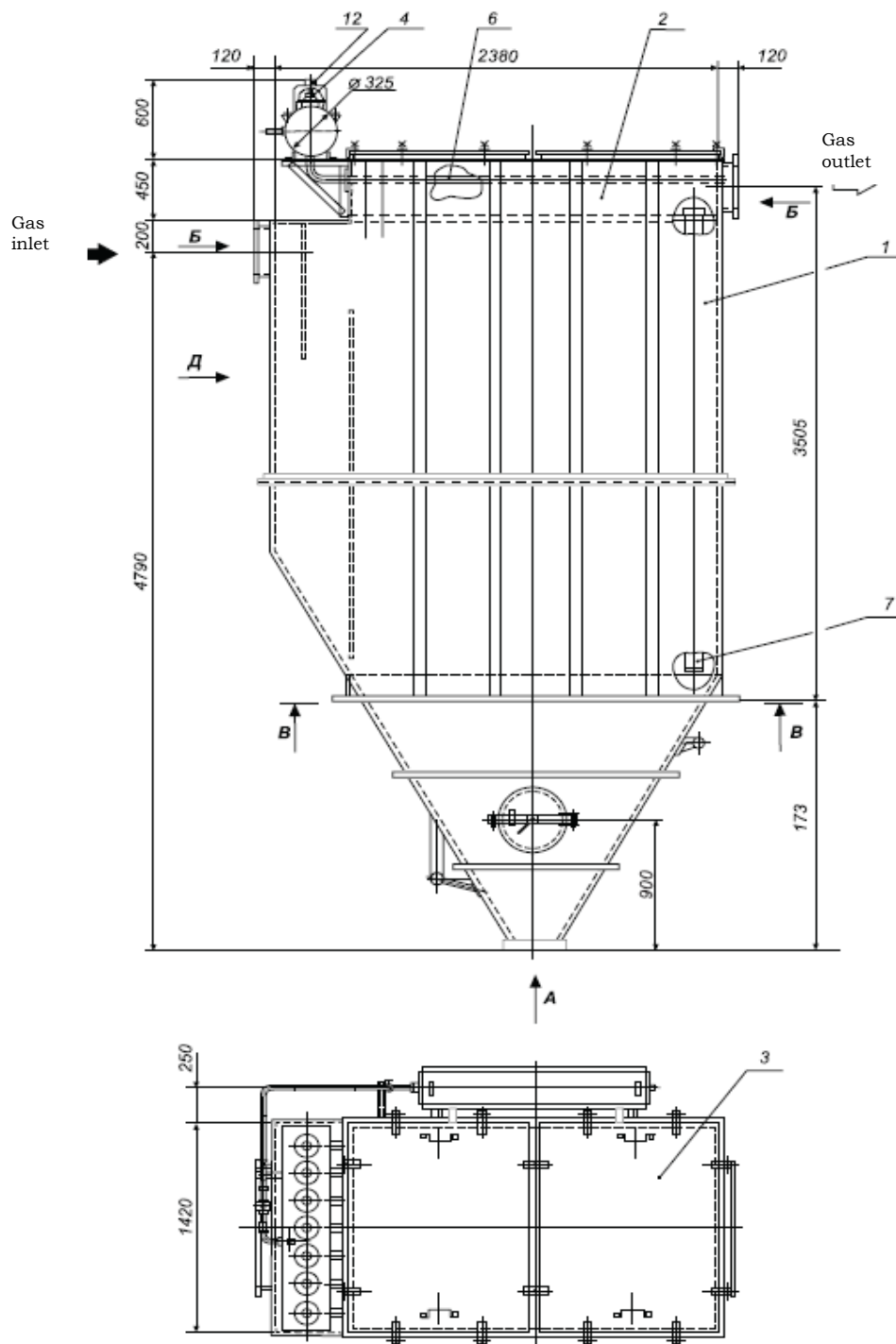
- |                                      |                                    |
|--------------------------------------|------------------------------------|
| 1. Housing                           | 6. Distributing header             |
| 2. Clean gas compartment             | 7. Bag filter                      |
| 3. Lid                               | 8. Compressed air reduction system |
| 4. Blow-down valve                   | 9. Heat-insulating shell           |
| 5. Cleaning compressed air collector | 10. Hatch                          |



### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h	up to 9000
2. Filtering area, m <sup>2</sup>	98
3. Number of bag filters, pcs	56
4. Bag filter length, m	4.15
5. Baghouse mass, t	2.75
6. Compressed air flow rate, nm <sup>3</sup> /min, max	2.4

# FRIR – 110

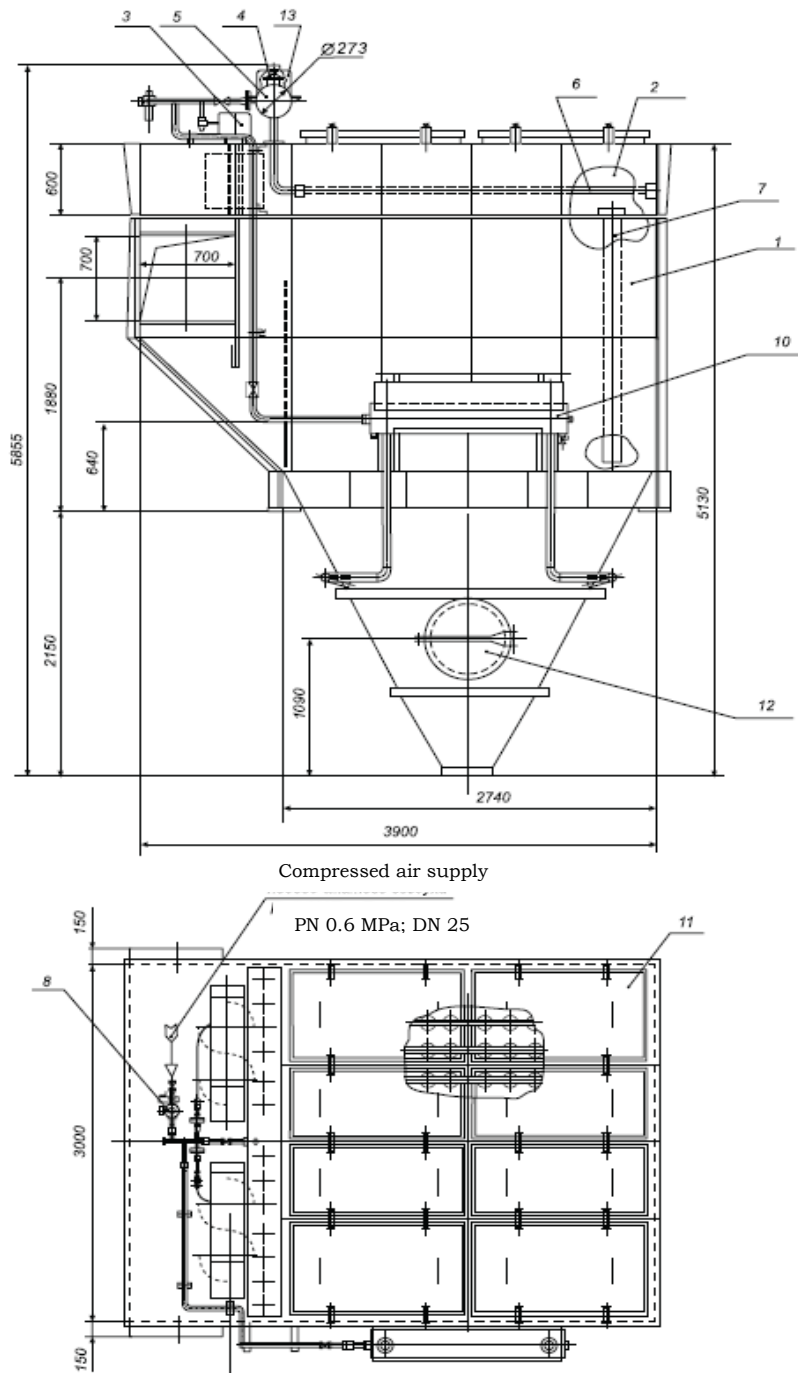


### Baghouse Components

- |                                      |   |
|--------------------------------------|---|
| 1. Housing                           | 7. Bag filter                                     |
| 2. Clean gas compartment             | 8. Compressed air reduction system                |
| 3. Lid                               | 9. Dust pneumatic shattering system               |
| 4. Blow-down valve                   | 10. Pneumatic shattering compressed air collector |
| 5. Cleaning compressed air collector | 11. Hatch   |
| 6. Distributing header               | 12. Heat-insulating shell                         |



# FRIR – 160

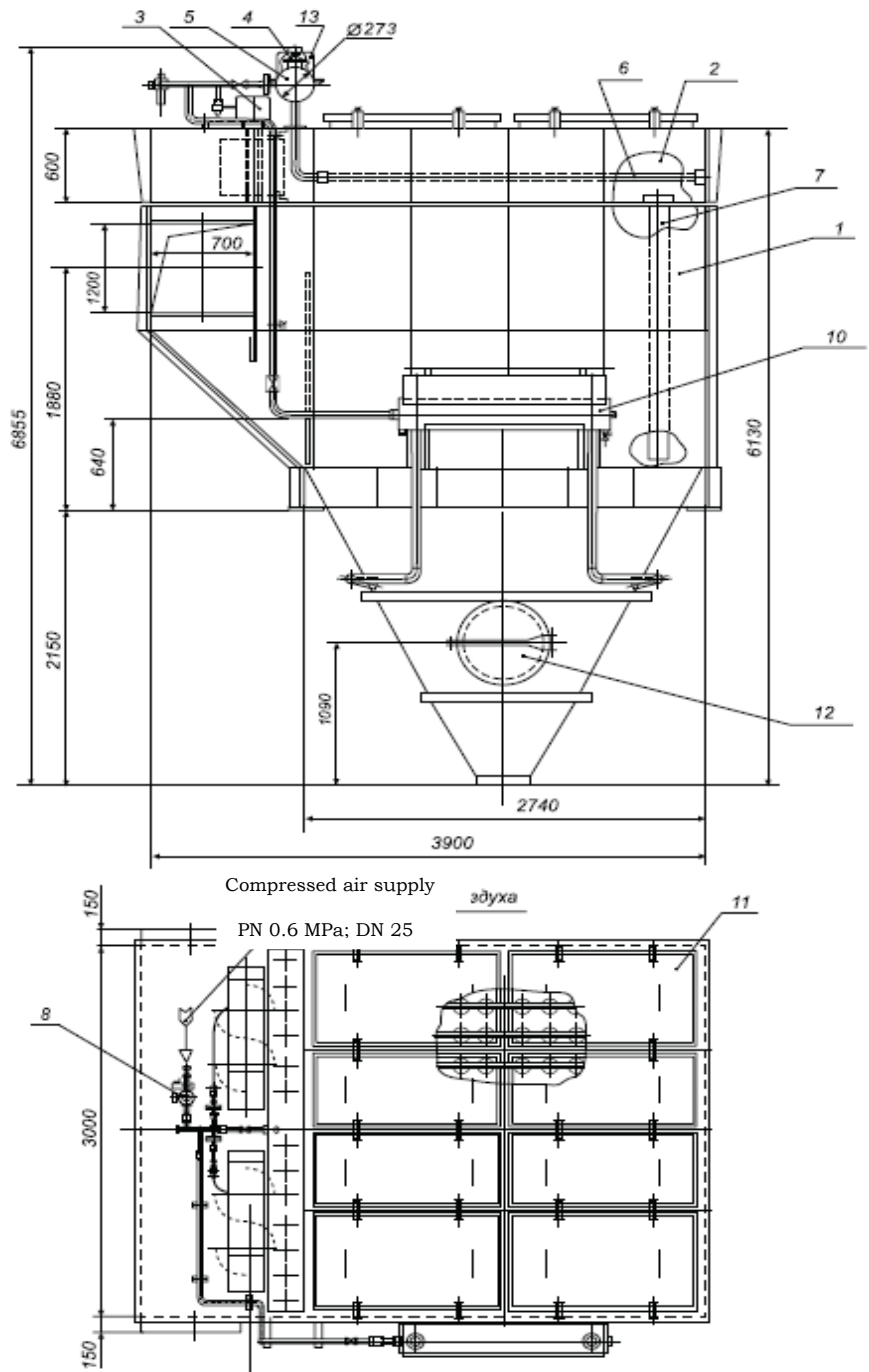


### Baghouse Components

- |                             |  |
|-----------------------------|--|
| 1. Housing                  | 8. Compressed air reduction system           |
| 2. Clean gas compartment    | 9. Dust shattering system                    |
| 3. Cut-off valve            | 10. Dust shattering compressed air collector |
| 4. Blow-down valve          | 11. Lid                                      |
| 5. Compressed air collector | 12. Hatch                                    |
| 6. Distributing header      | 13. Heat-insulating shell                    |
| 7. Bag filter               |  |



# FRIR - 250

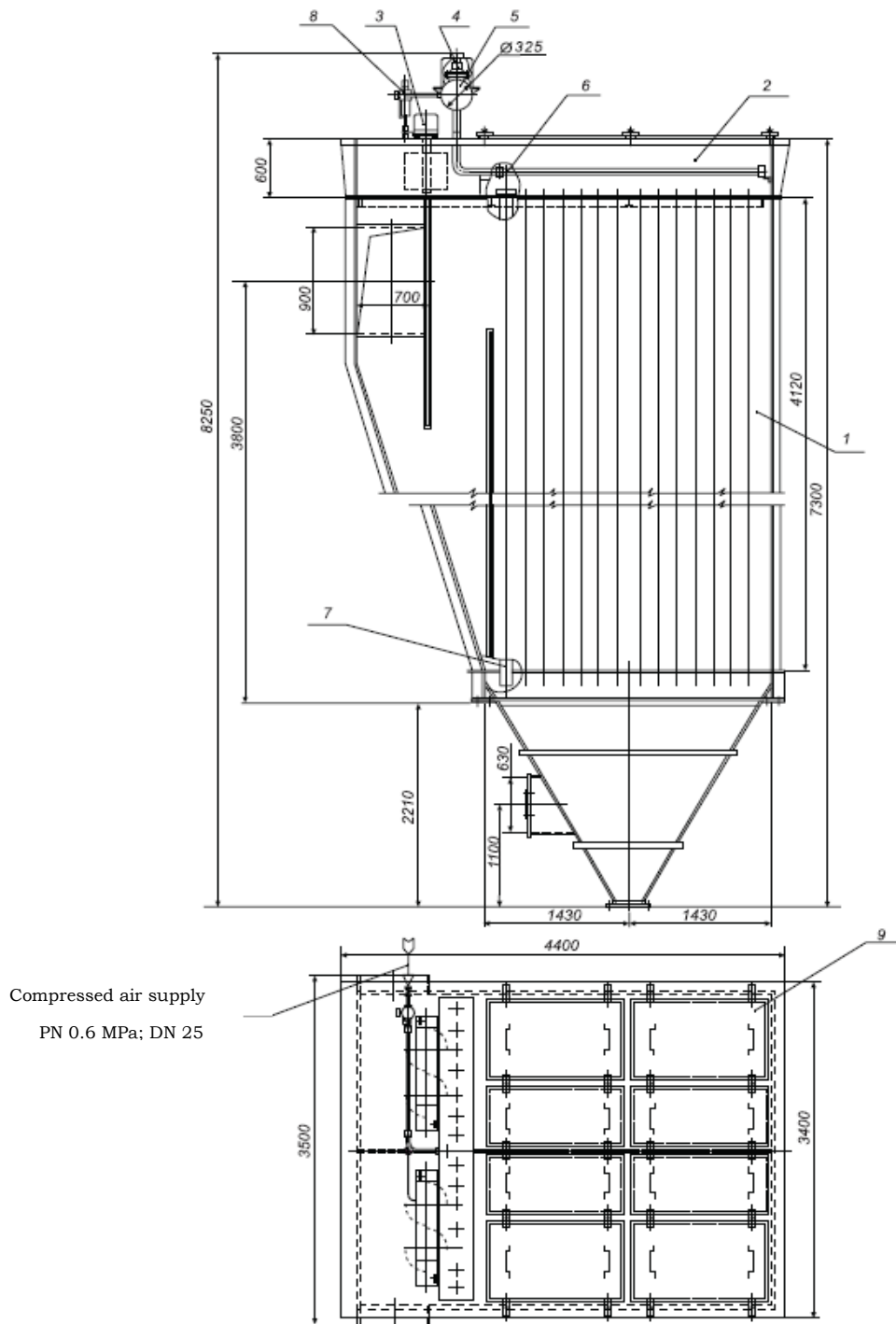


### Baghouse Components

- 1. Housing
- 2. Clean gas compartment
- 3. Cut-off valve
- 4. Blow-down valve
- 5. Cleaning compressed air collector
- 6. Distributing header
- 7. Bag filter
- 8. Compressed air reduction system
- 9. Dust shattering system
- 10. Dust pneumatic shattering compressed air collector
- 11. Lid
- 12. Hatch
- 13. Heat-insulating shell

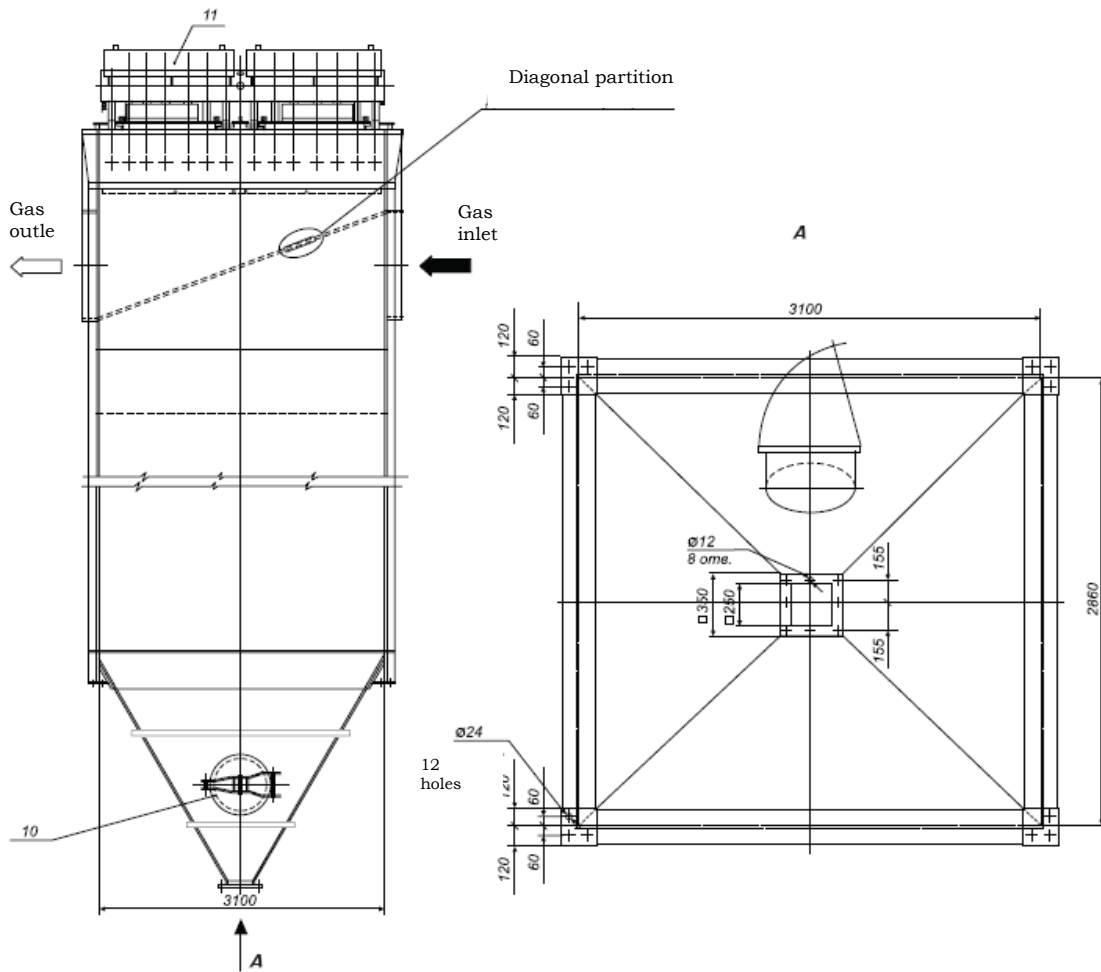


# FRIR - 340



### Baghouse Components

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| 1. Housing                           | 7. Bag filter                      |
| 2. Clean gas compartment             | 8. Compressed air reduction system |
| 3. Cut-off valve                     | 9. Lid                             |
| 4. Blow-down valve                   | 10. Hatch                          |
| 5. Cleaning compressed air collector | 11. Heat-insulating shell          |
| 6. Distributing header               |                                    |



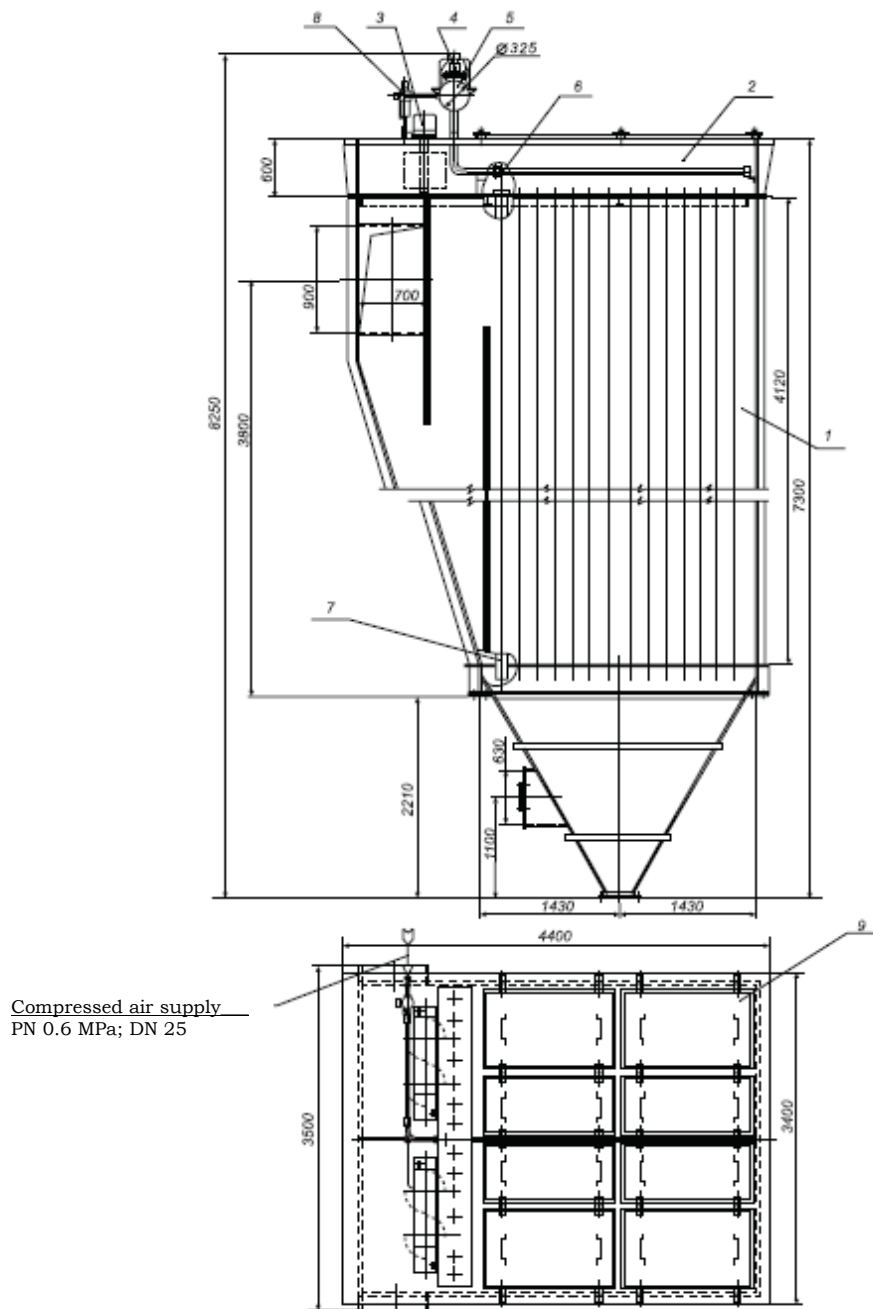
### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h	up to 31000
2. Filtering area, m <sup>2</sup>	345
3. Number of bag filters, pcs	196
4. Bag filter length, m	4.15
5. Baghouse mass, t	12.3
6. Compressed air flow rate, nm <sup>3</sup> /min, max	4.5

**Note**

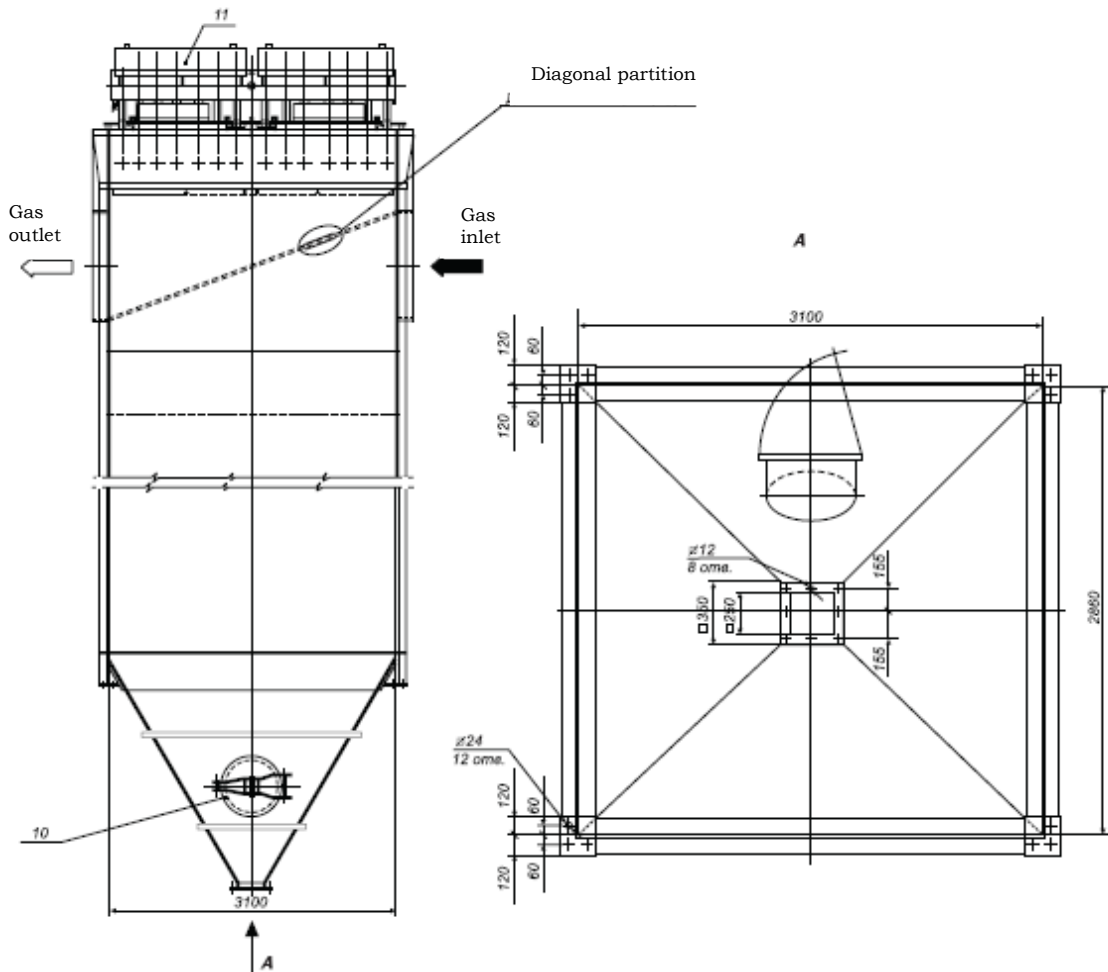
Gas inlet-outlet depends on position of diagonal partition and to be determined by process engineer in gas treatment facility design.

# FRIR - 400



## Baghouse Components

- |                                   |                                    |
|-----------------------------------|------------------------------------|
| 1. Housing                        | 7. Bag filter                      |
| 2. Clean gas compartment          | 8. Compressed air reduction system |
| 3. Cut-off valve                  | 9. Lid                             |
| 4. Blow-down valve                | 10. Hatch                          |
| 5. Clean compressed air collector | 11. Heat-insulating shell          |
| 6. Distributing header            |                                    |



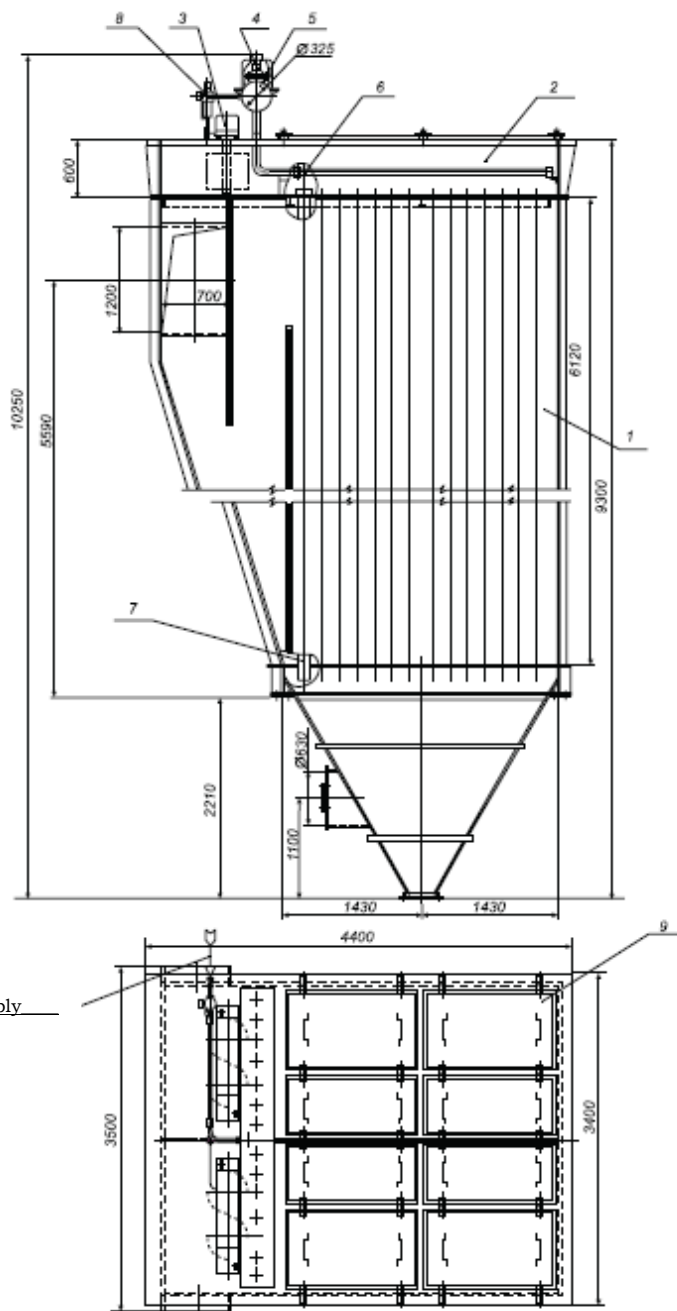
### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h	up to 38600
2. Filtering area, m <sup>2</sup>	429
3. Number of bag filters, pcs	196
4. Bag filter length, m	5.16
5. Baghouse mass, t	14.3
6. Compressed air flow rate, nm <sup>3</sup> /min, max	4.5

Note

Gas inlet-outlet depends on position of diagonal partition and to be determined by process engineer in gas treatment facility design.

# FRIR - 500



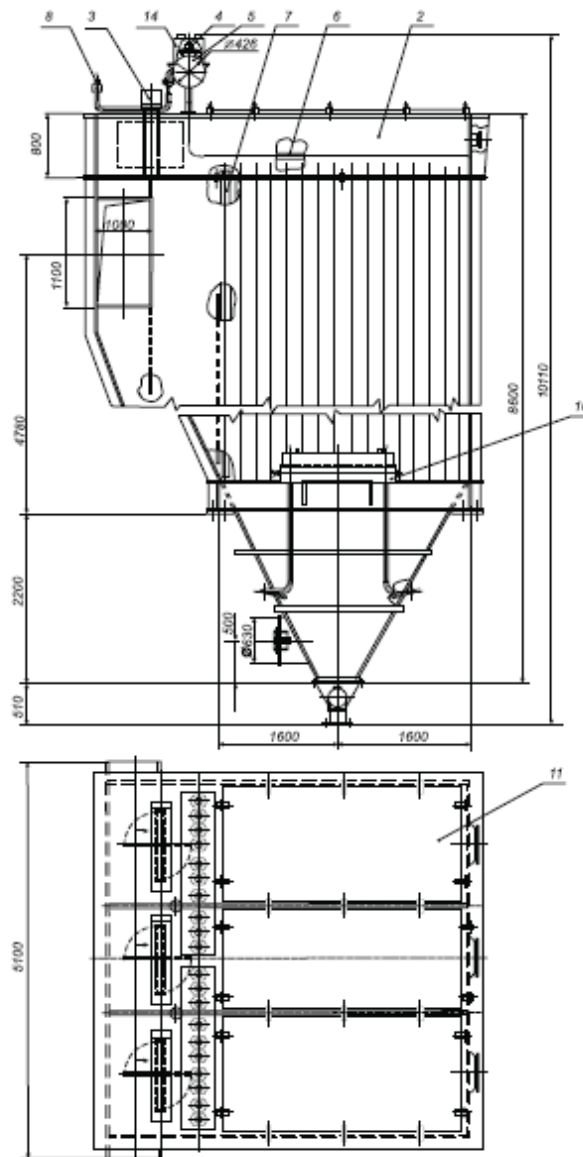
Compressed air supply  
PN 0.6 MPa; DN 25

### Baghouse Components

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| 1. Housing                           | 7. Bag filter                      |
| 2. Clean gas compartment             | 8. Compressed air reduction system |
| 3. Cut-off valve                     | 9. Lid                             |
| 4. Blow-down valve                   | 10. Hatch                          |
| 5. Cleaning compressed air collector | 11. Heat-insulating shell          |
| 6. Distributing header               |                                    |



## FRIR - 650

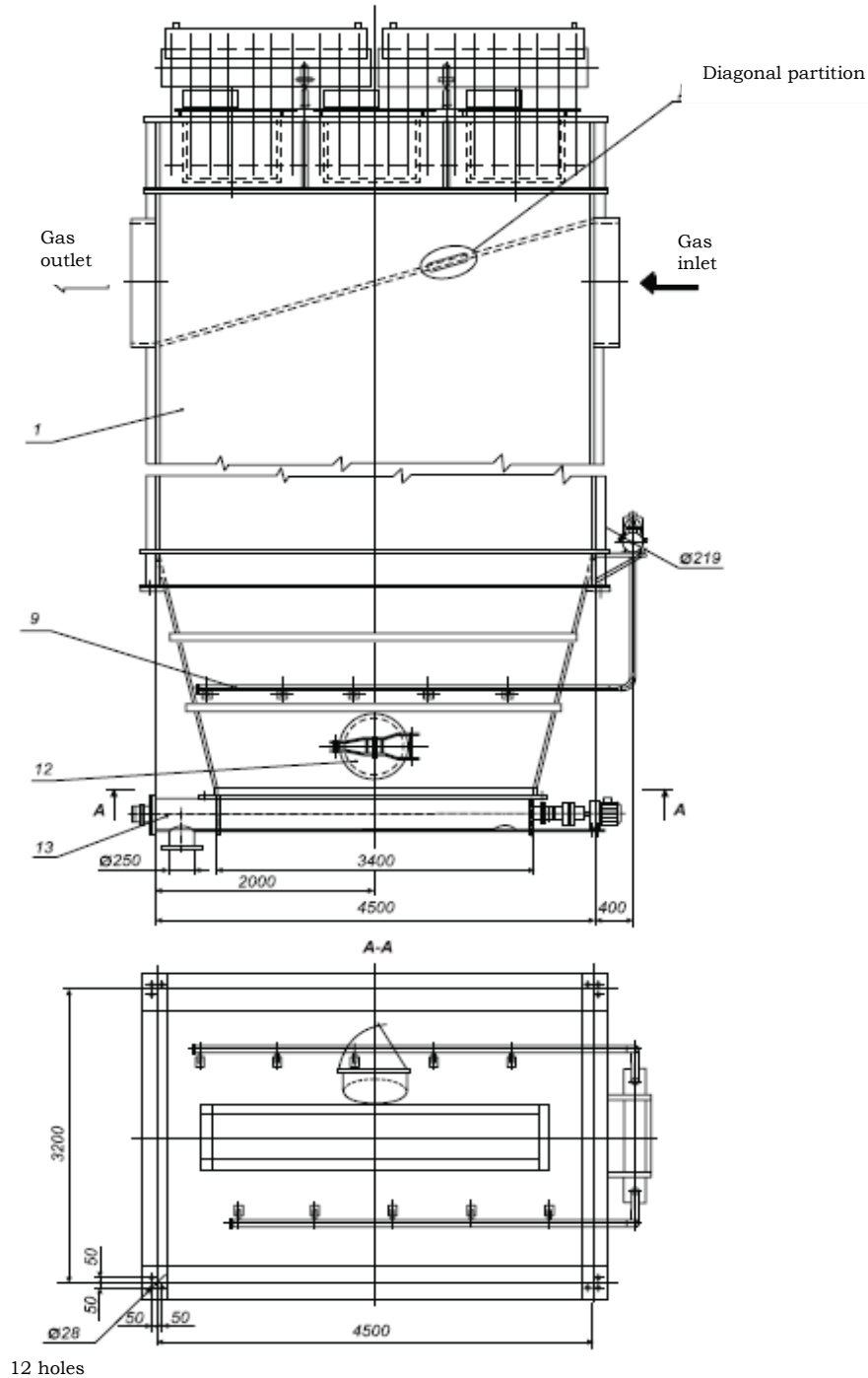


### Baghouse Components

- |                             |  |
|-----------------------------|--|
| 1. Housing                  | 8. Compressed air reduction system                     |
| 2. Clean gas compartment    | 9. Pneumatic dust shattering system                    |
| 3. Cut-off valve            | 10. Pneumatic dust shattering compressed air collector |
| 4. Blow-down valve          | 11. Lid  |
| 5. Compressed air collector | 12. Hatch  |
| 6. Distributing header      | 13. Dust discharge unit                                |
| 7. Bag filter               | 14. Heat-insulating shell                              |

#### Note

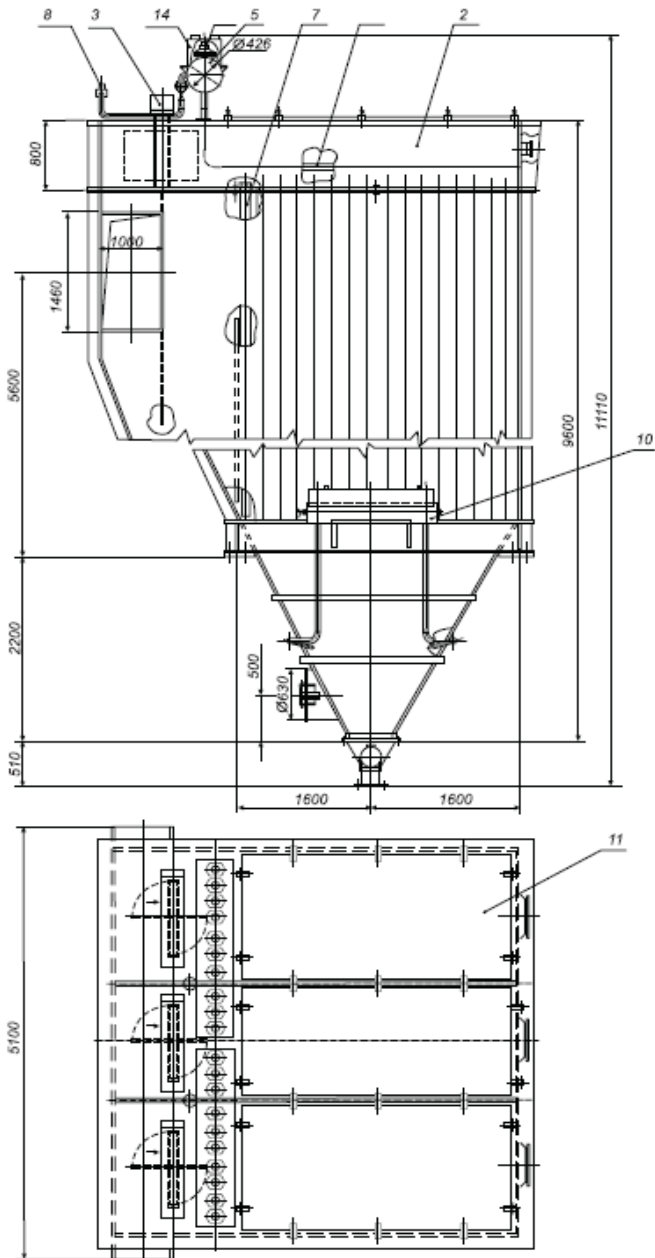
1. Gas inlet-outlet depends on position of diagonal partition and to be determined by process engineer in gas treatment facility design.
2. Dust discharge unit position shall also be determined by process engineer and may be installed in inversed manner.
3. Process engineer shall also determine type of dust level sensor , quantity and location in the hopper .



### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h	up to 58500
2. Filtering area, m <sup>2</sup>	650
3. Number of bag filters, pcs	300
4. Bag filter length, m	5.1
5. Baghouse mass, t	22
6. Compressed air flow rate, nm <sup>3</sup> /min, max	6.3
7. Dust discharge unit (screw-type):	
- motor power, kW	0.75
- screw speed, rev./min	9
- maximum capacity, m <sup>3</sup> /hm <sup>3</sup> /h	2.2

# FRIR - 800

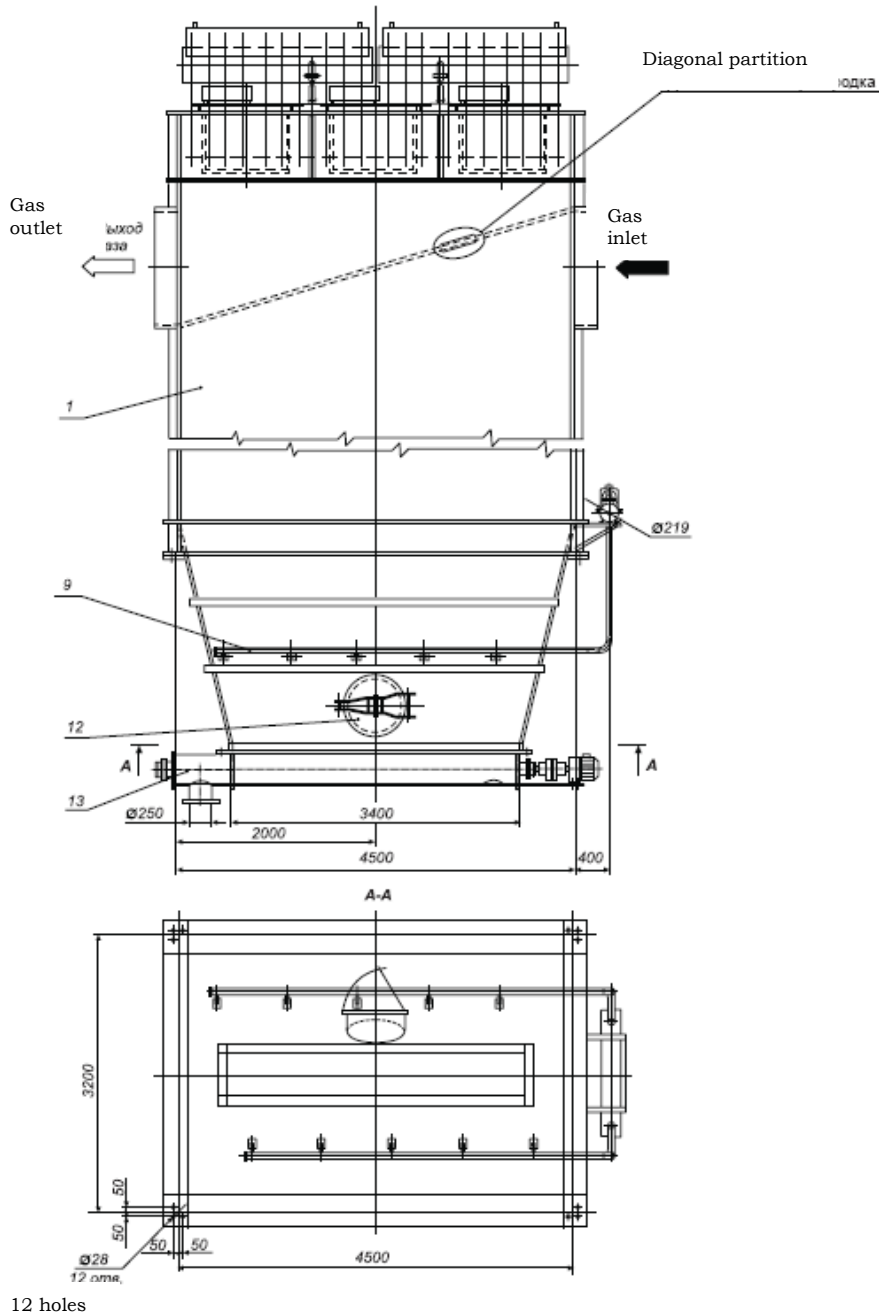


## Baghouse Components

- |                                      |  |
|--------------------------------------|--|
| 1. Housing                           | 8. Compressed air reduction system                     |
| 2. Clean gas compartment             | 9. Pneumatic dust shattering system                    |
| 3. Cut-off valve                     | 10. Pneumatic dust shattering compressed air collector |
| 4. Blow-down valve                   | 11. Lid  |
| 5. Cleaning compressed air collector | 12. Hatch  |
| 6. Distributing header               | 13. Dust discharge unit                                |
| 7. Bag filter                        | 14. Heat-insulating shell                              |

Note

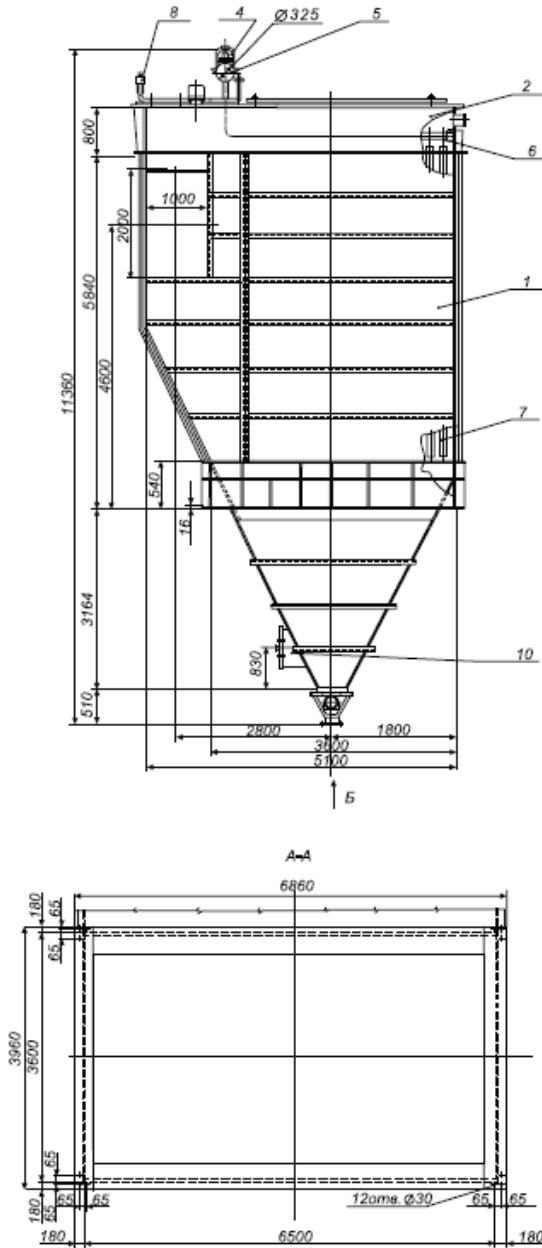
- Gas inlet-outlet depends on position of diagonal partition and to be determined by process engineer in gas treatment facility design.
- Dust discharge unit position shall also be determined by process engineer and may be installed in inversed manner.
- Process engineer shall also determine type of dust level sensor , quantity and location in the hopper.



### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h	up to 71000
2. Filtering area, m <sup>2</sup>	790
3. Number of bag filters, pcs	300
4. Bag filter length, m	6.1
5. Baghouse mass, t	23.7
6. Compressed air flow rate, nm <sup>3</sup> /min, max	6.3
7. Dust discharge unit (screw-type):	
- motor power, kW	0.75
- screw speed, rev./min	9
- maximum capacity, m <sup>3</sup> /h	2.2

# FRIR - 1000

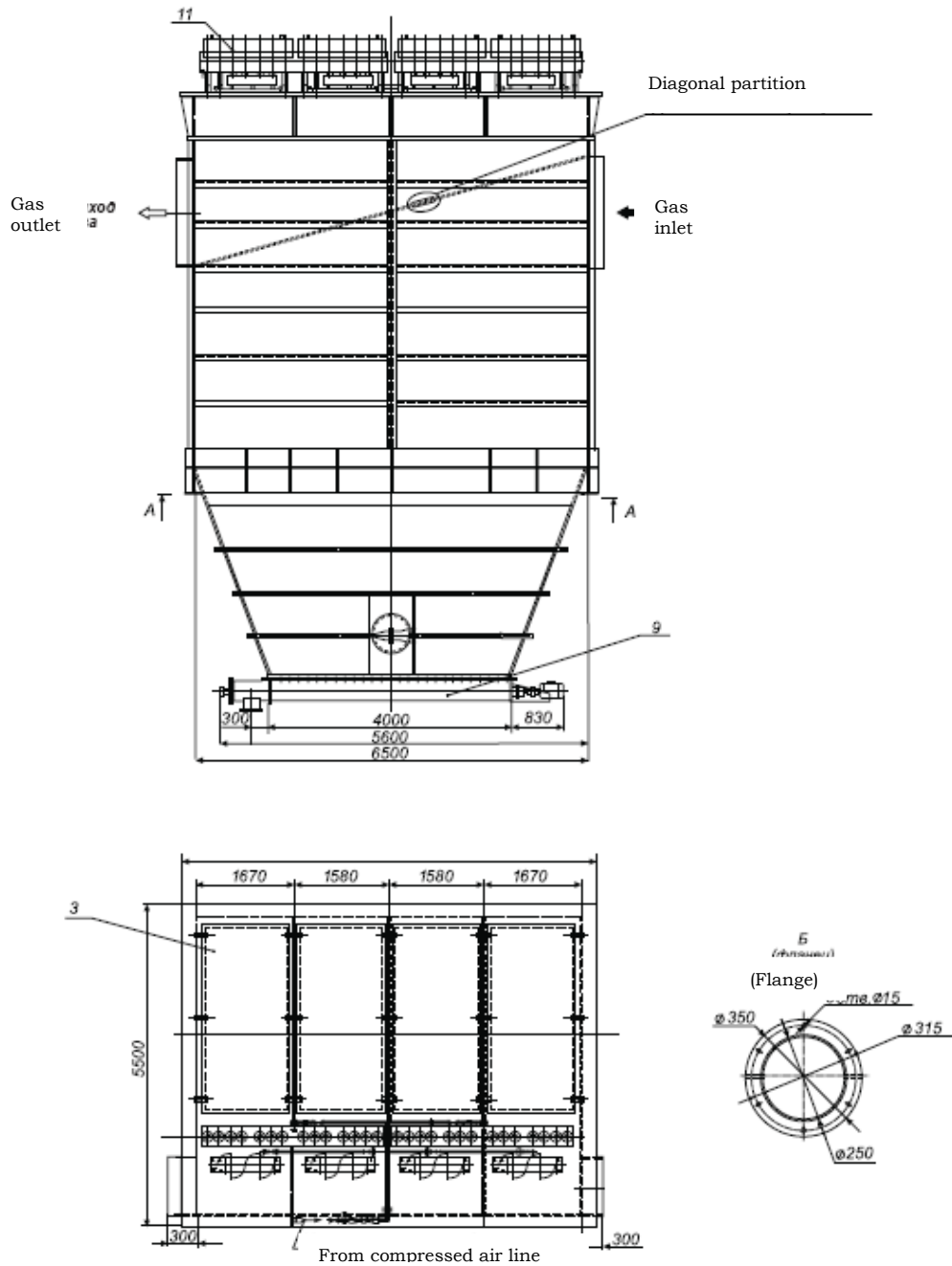


## Baghouse Components

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| 1. Housing                           | 7. Bag filter                      |
| 2. Clean gas compartment             | 8. Compressed air reduction system |
| 3. Lid                               | 9. Dust discharge unit             |
| 4. Blow-down valve                   | 10. Hatch                          |
| 5. Cleaning compressed air collector | 11. Heat-insulating shell          |
| 6. Distributing header               |                                    |

Note

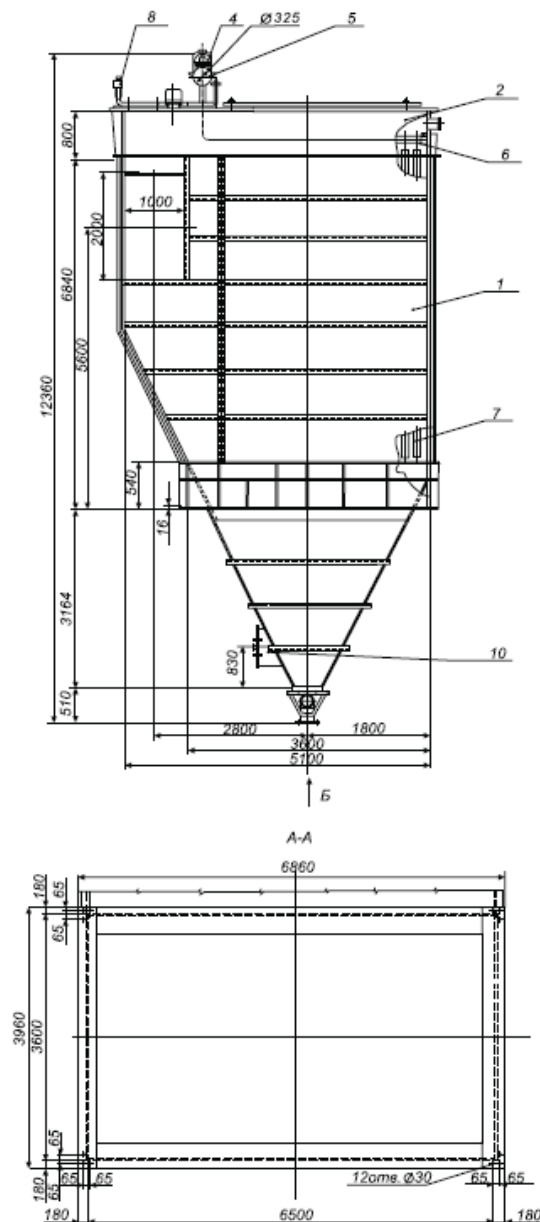
- Gas inlet-outlet depends on position of diagonal partition and to be determined by process engineer in gas treatment facility design.
- Dust discharge unit position shall also be determined by process engineer and may be installed in inversed manner.
- Process engineer shall also determine type of dust level sensor , quantity and location in the hopper .



### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h	up to 88300
2. Filtering area, m <sup>2</sup>	980
3. Number of bag filters, pcs	448
4. Bag filter length, m	5.2
5. Baghouse mass, t	31.5
6. Compressed air flow rate, nm <sup>3</sup> /min, max	6.3
7. Dust discharge unit (screw-type):	
- motor power, kW	0.75
- screw speed, rev./min	9
- maximum capacity, m <sup>3</sup> /h	2.2

# FRIR - 1200

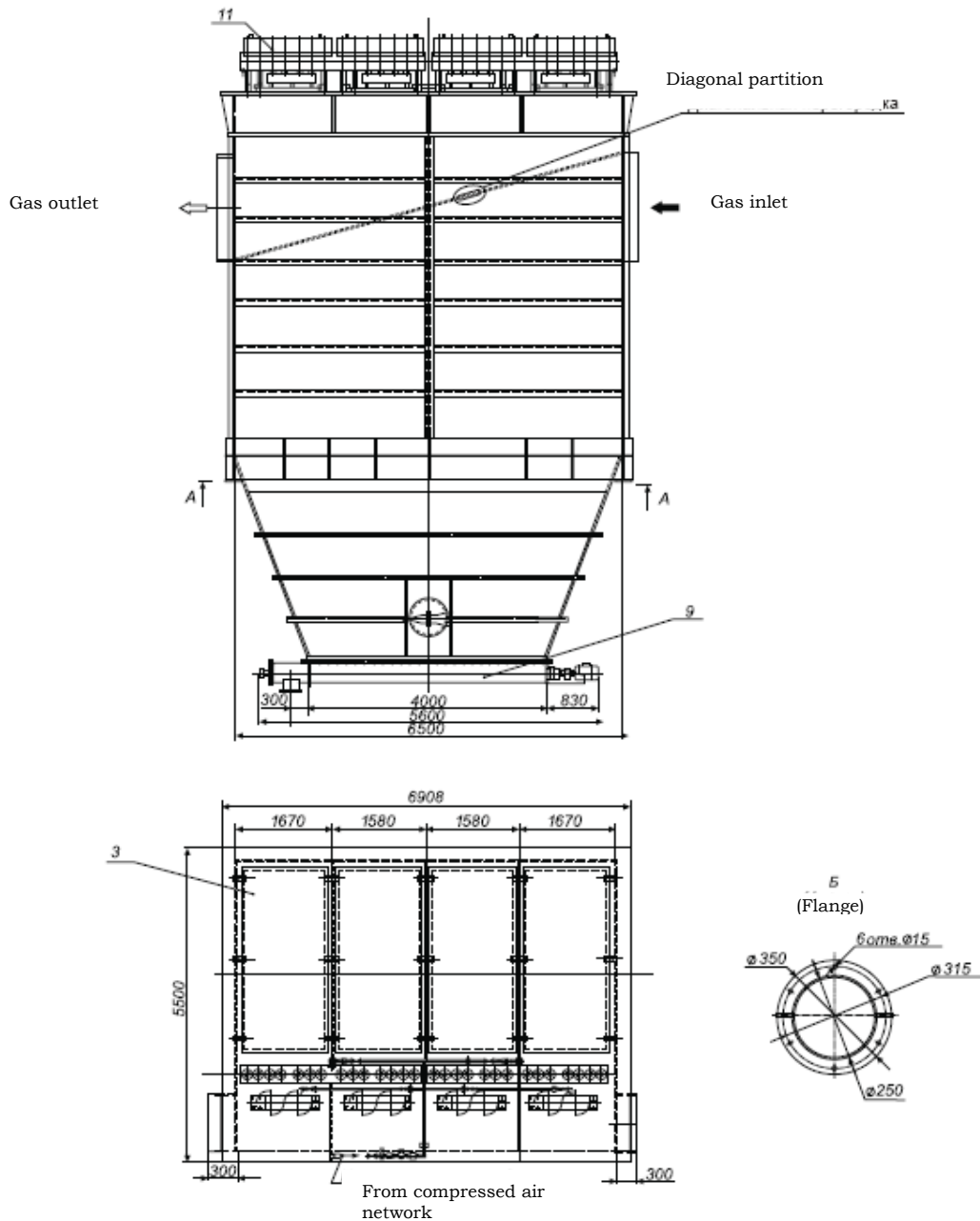


## Baghouse Components

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| 1. Housing                           | 7. Bag filter                      |
| 2. Clean gas compartment             | 8. Compressed air reduction system |
| 3. Крышка                            | 9. Dust discharge unit             |
| 4. Blow-down valve                   | 10. Hatch                          |
| 5. Cleaning compressed air collector | 11. Heat-insulating shell          |
| 6. Distributing header               |                                    |

Note

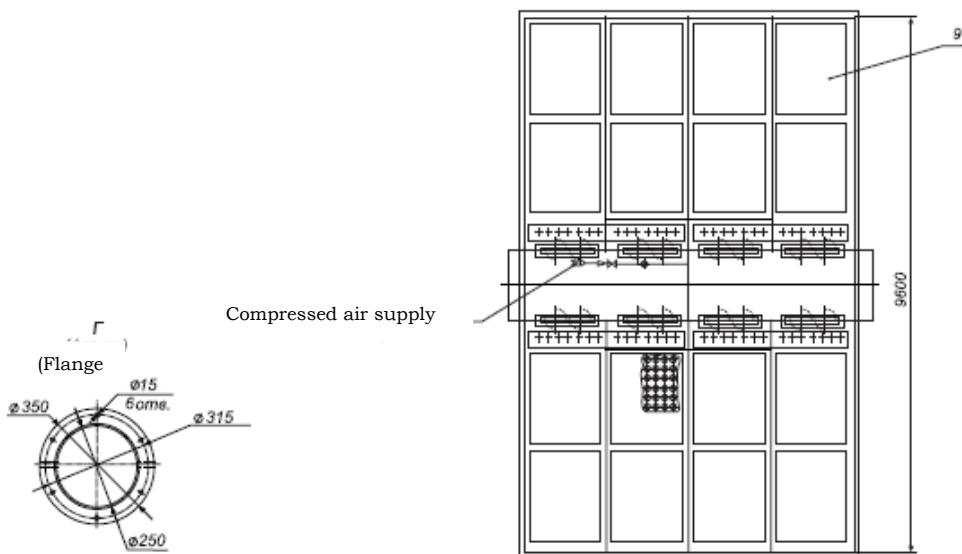
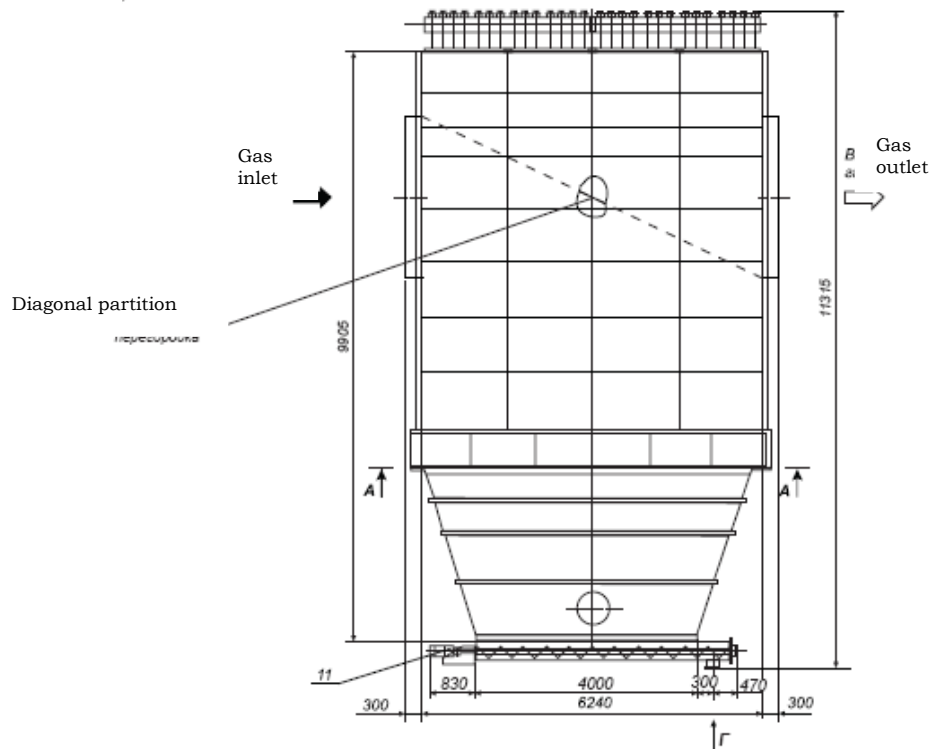
- Gas inlet-outlet depends on position of diagonal partition and to be determined by process engineer in gas treatment facility design.
- Dust discharge unit position shall also be determined by process engineer and may be installed in inversed manner.
- Process engineer shall also determine type of dust level sensor , its quantity and location in the hopper.



### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h	up to 110,000
2. Filtering area, m <sup>2</sup>	1200
3. Number of bag filters, pcs	448
4. Bag filter length, m	6.3
5. Baghouse mass, t	33.9
6. Compressed air flow rate, nm <sup>3</sup> /min, max	6.3
7. Dust discharge unit (screw-type):	
- motor power, kW	0.75
- screw speed, rev./min	9
- maximum capacity, m <sup>3</sup> /h	2.2

# FRIR - 2200

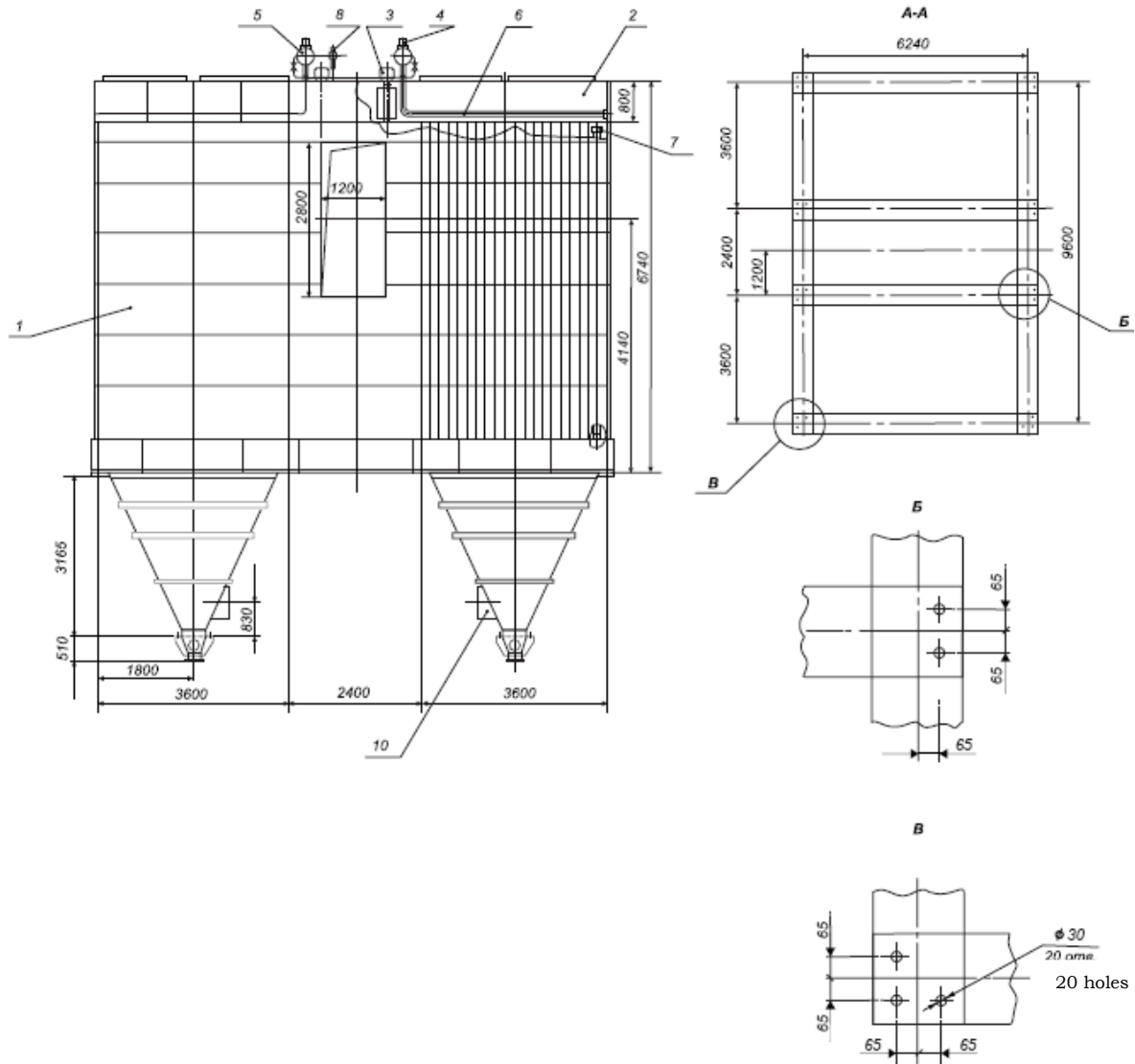


## Baghouse Components

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| 1. Housing                           | 7. Bag filter                      |
| 2. Clean gas compartment             | 8. Compressed air reduction system |
| 3. Cut-off valve                     | 9. Lid                             |
| 4. Blow-down valve                   | 10. Hatch                          |
| 5. Cleaning compressed air collector | 11. Dust discharge unit            |
| 6. Distributing header               |                                    |

Note

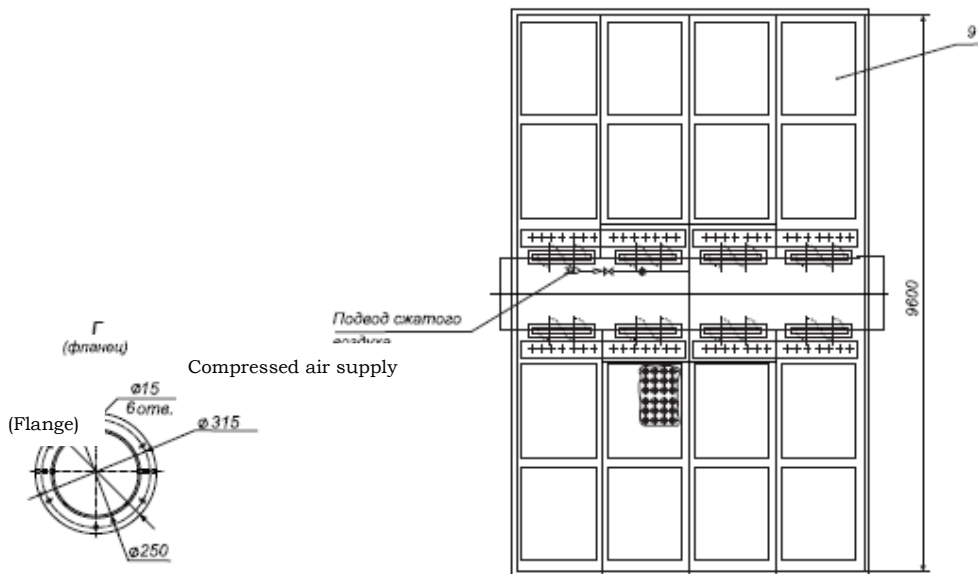
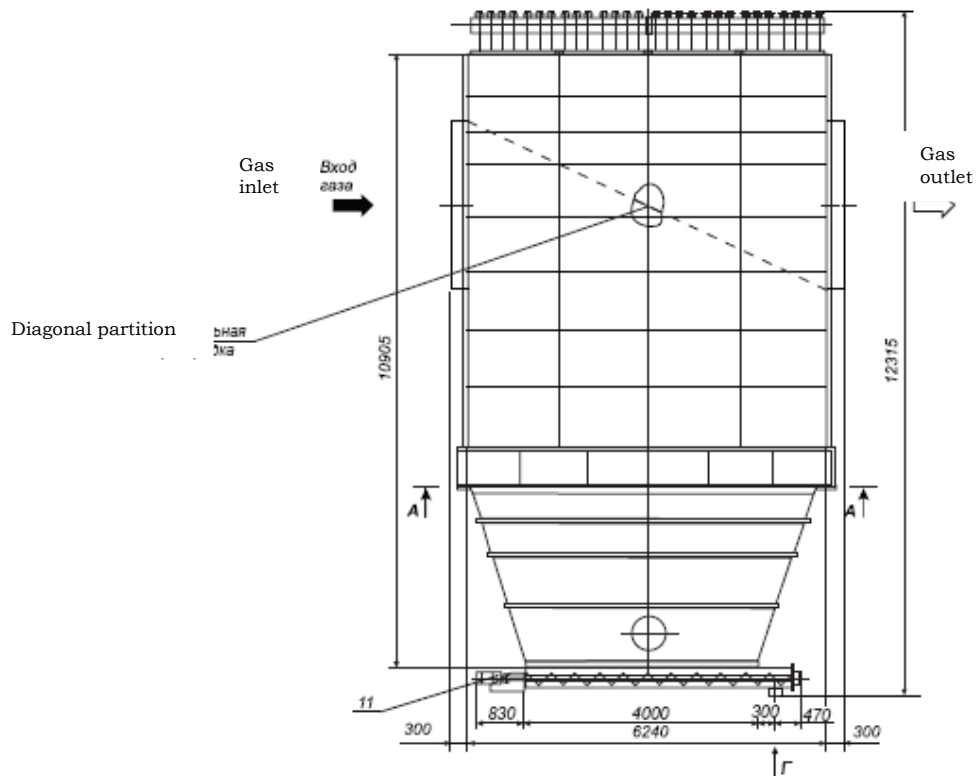
- Gas inlet-outlet depends on position of diagonal partition and to be determined by process engineer in gas treatment facility design.
- Dust discharge unit position shall also be determined by process engineer and may be installed in inversed manner.
- Process engineer shall select dust discharge unit capacity on technical characteristics (see item 7)
- Process engineer shall also determine type of dust level sensor , its quantity and location in the hopper.



### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h	up to 200000
2. Filtering area, m <sup>2</sup>	2200
3. Number of bag filters, pcs	1008
4. Bag filter length, m	5.2
5. Baghouse mass, t	52
6. Compressed air flow rate, nm <sup>3</sup> /min, max	6.3
7. Dust discharge unit (screw-type):	
- motor power, kW	/0.75/1.1/1.5/2.2/
- screw speed, rev./min	/9/12.5/18/35.5/
- maximum capacity, m <sup>3</sup> /h	/2.2/3.0/4.3/8.6/

# FRIR - 2700

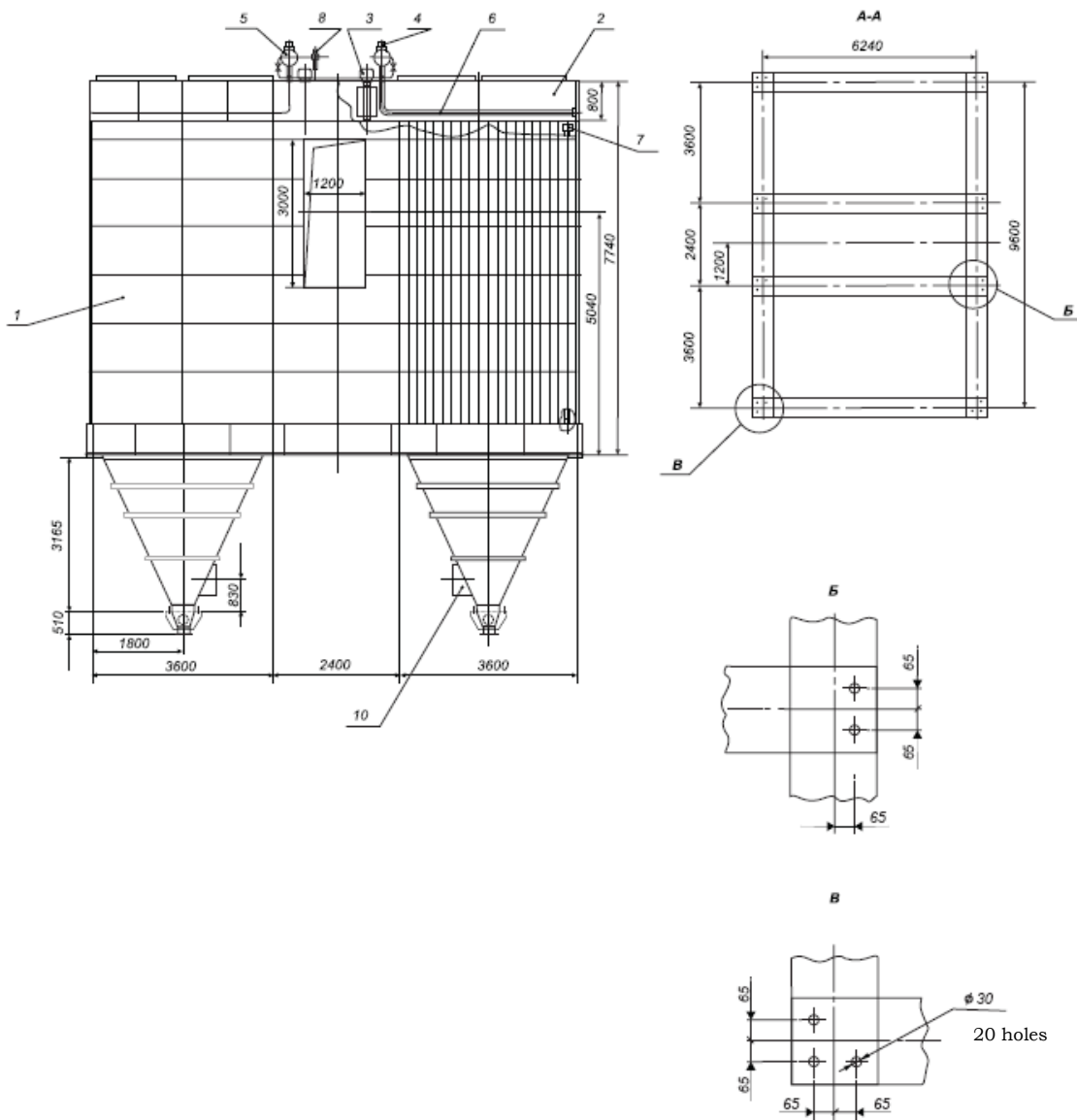


## Baghouse Components

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| 1. Housing                           | 7. Bag filter                      |
| 2. Clean gas compartment             | 8. Compressed air reduction system |
| 3. Cut-off valve                     | 9. Lid                             |
| 4. Blow-down valve                   | 10. Hatch                          |
| 5. Cleaning compressed air collector | 11. Dust discharge unit            |
| 6. Distributing header               |                                    |

**Note**

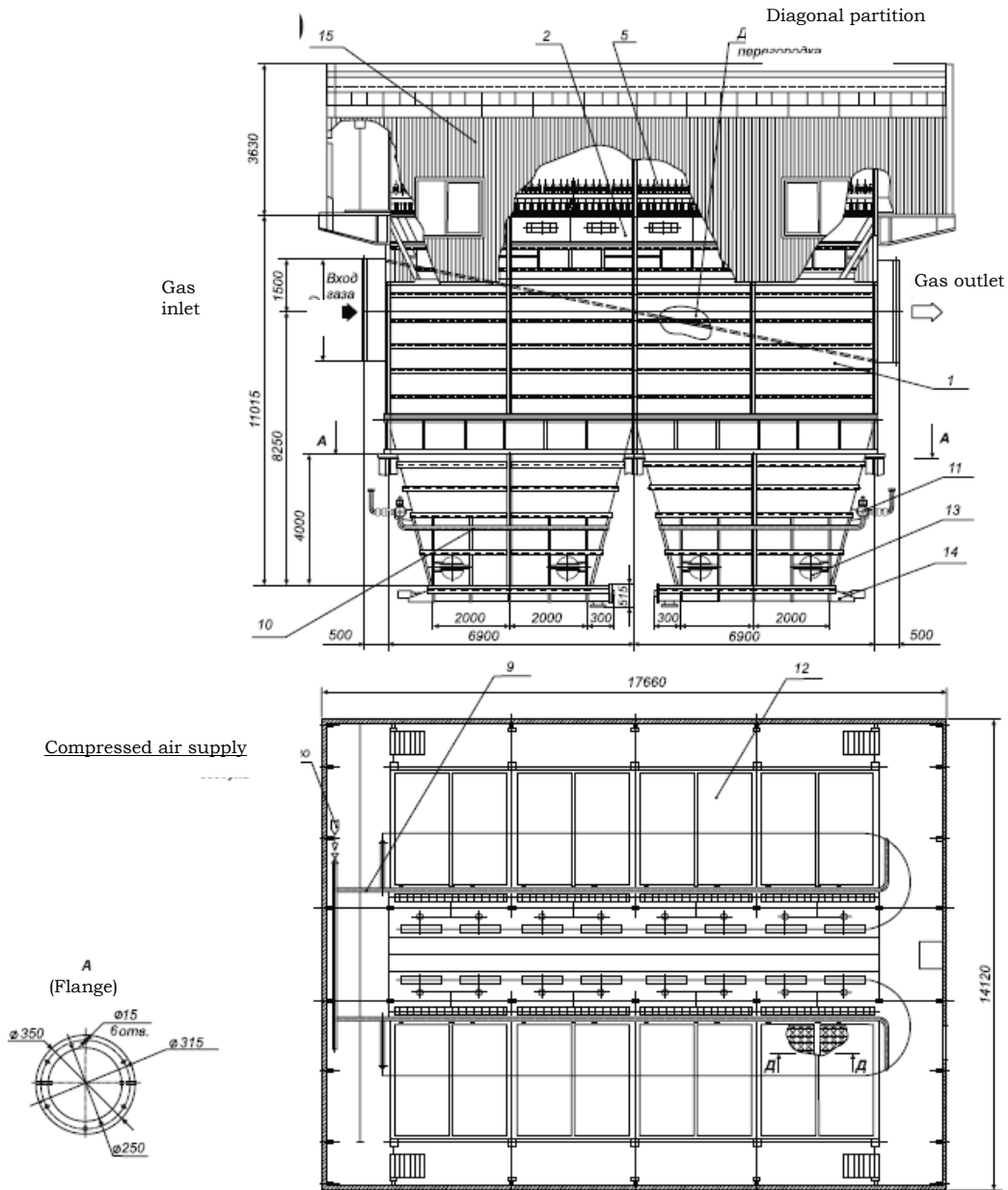
- Gas inlet-outlet depends on position of diagonal partition and to be determined by process engineer in gas treatment facility design.
- Dust discharge unit position shall also be determined by process engineer and may be installed in inversed manner.
- Process engineer shall select dust discharge unit capacity on technical characteristics (see item 7)
- Process engineer shall also determine type of dust level sensor , its quantity and location in the hopper.



### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h	up to 240000
2. Filtering area, m <sup>2</sup>	2700
3. Number of bag filters, pcs	1008
4. Bag filter length, m	6.3
5. Baghouse mass, t	56.6
6. Compressed air flow rate, nm <sup>3</sup> /min, max	6.3
7. Dust discharge unit (screw-type):	
- motor power, kW	/0.75/1.1/1.5/2.2/
- screw speed, rev./min	/9/12.5/18/35.5/
- maximum capacity, m <sup>3</sup> /h	/2.2/3.0/4.3/8.6/

# FRIR - 5000

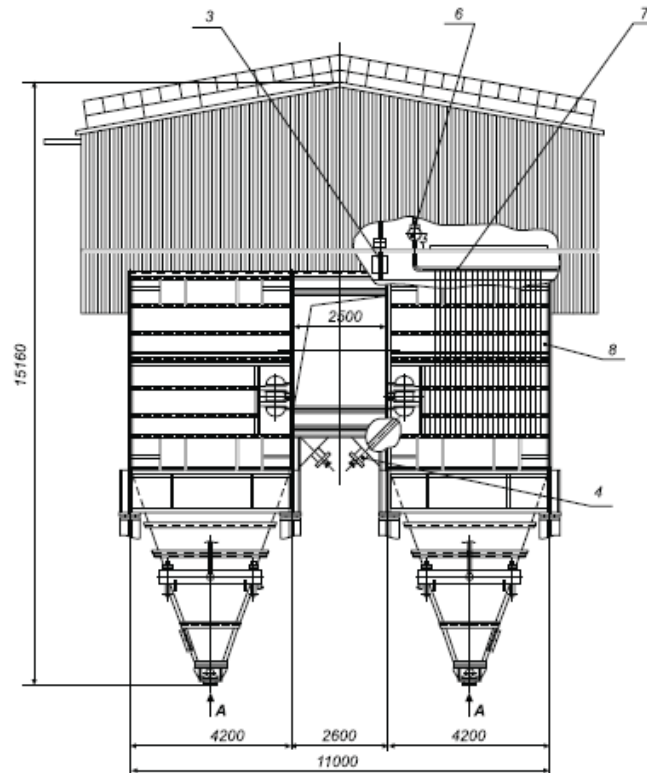


### Baghouse Components

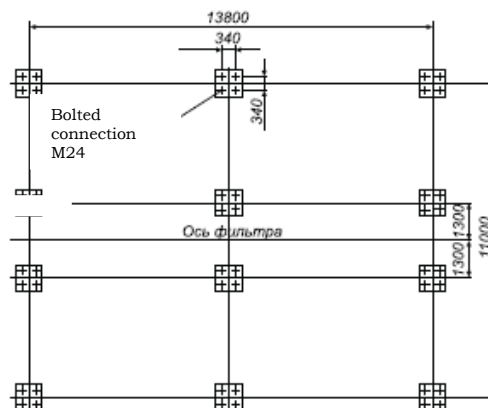
- |                                      |   |
|--------------------------------------|---|
| 1. Housing                           | 9. Compressed air reduction system                |
| 2. Clean gas compartment             | 10. Pneumatic dust shattering system              |
| 3. Cut-off valve                     | 11. Pneumatic shattering compressed air collector |
| 4. Dirty gas cut-off valve           | 12. Lid   |
| 5. Blow-down valve                   | 13. Hatch   |
| 6. Cleaning compressed air collector | 14. Dust discharge unit                           |
| 7. Distributing header               | 15. Roof  |
| 8. Bag filter                        |   |

Note

- Gas inlet-outlet depends on position of diagonal partition and to be determined by process engineer in gas treatment facility design.
- Dust discharge unit position shall also be determined by process engineer and may be installed in inversed manner.
- Process engineer shall select dust discharge unit capacity on technical characteristics (see item 7)
- Process engineer shall also determine type of dust level sensor , quantity and location in the hopper.



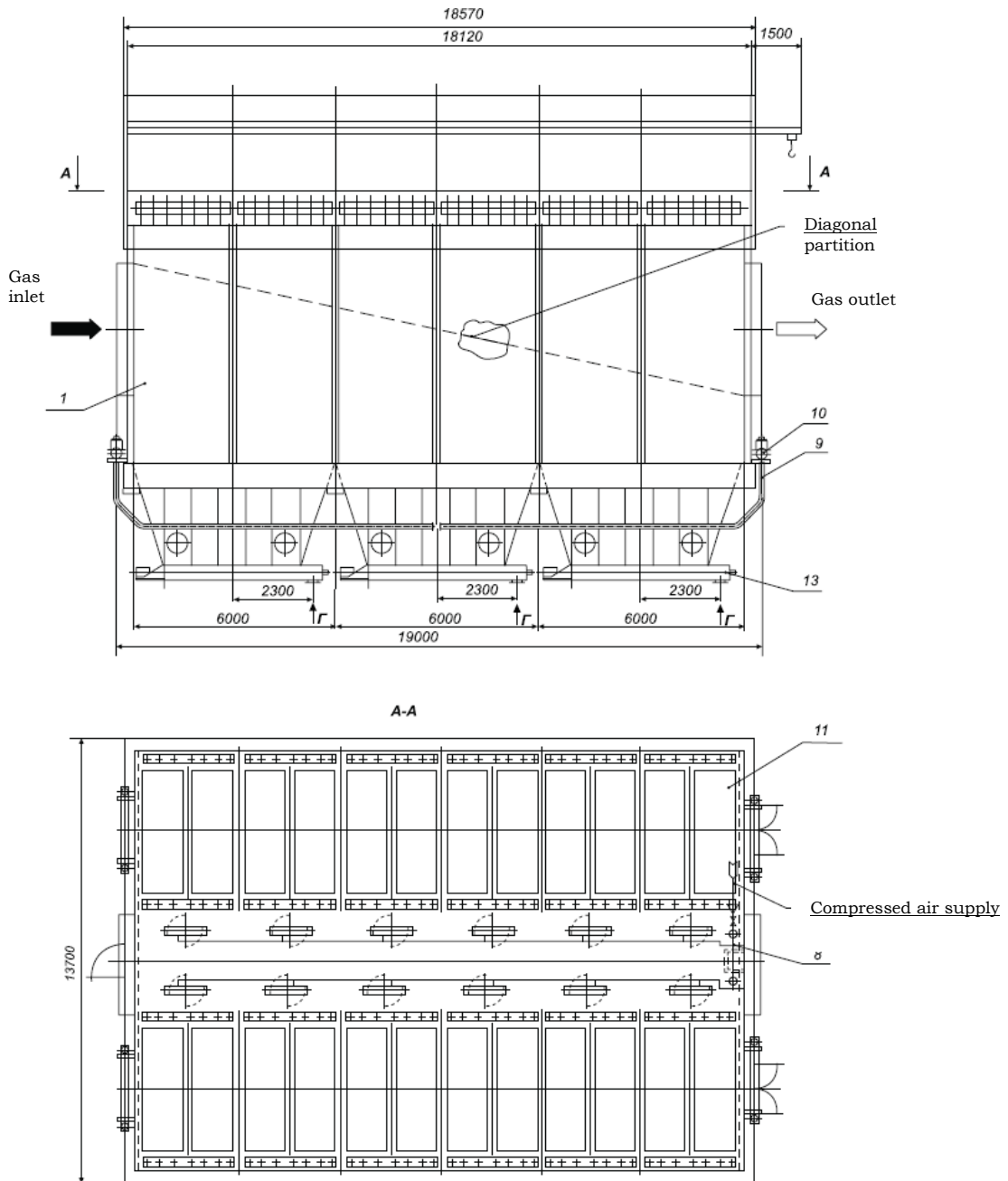
Layout of rocker bearings



### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h	up to 450000
2. Filtering area, m <sup>2</sup>	5000
3. Number of bag filters, pcs	2304
4. Bag filter length, m	5.16
5. Baghouse mass, t	200
6. Compressed air flow rate, nm <sup>3</sup> /min, max	9
7. Dust discharge unit (screw-type):	
- motor power, kW	/0.75/1.1/1.5/2.2/
- screw speed, rev./min	/9/12.5/18/35.5/
- maximum capacity, m <sup>3</sup> /h	/2.2/3.0/4.3/8.6/

# FRIR - 7000

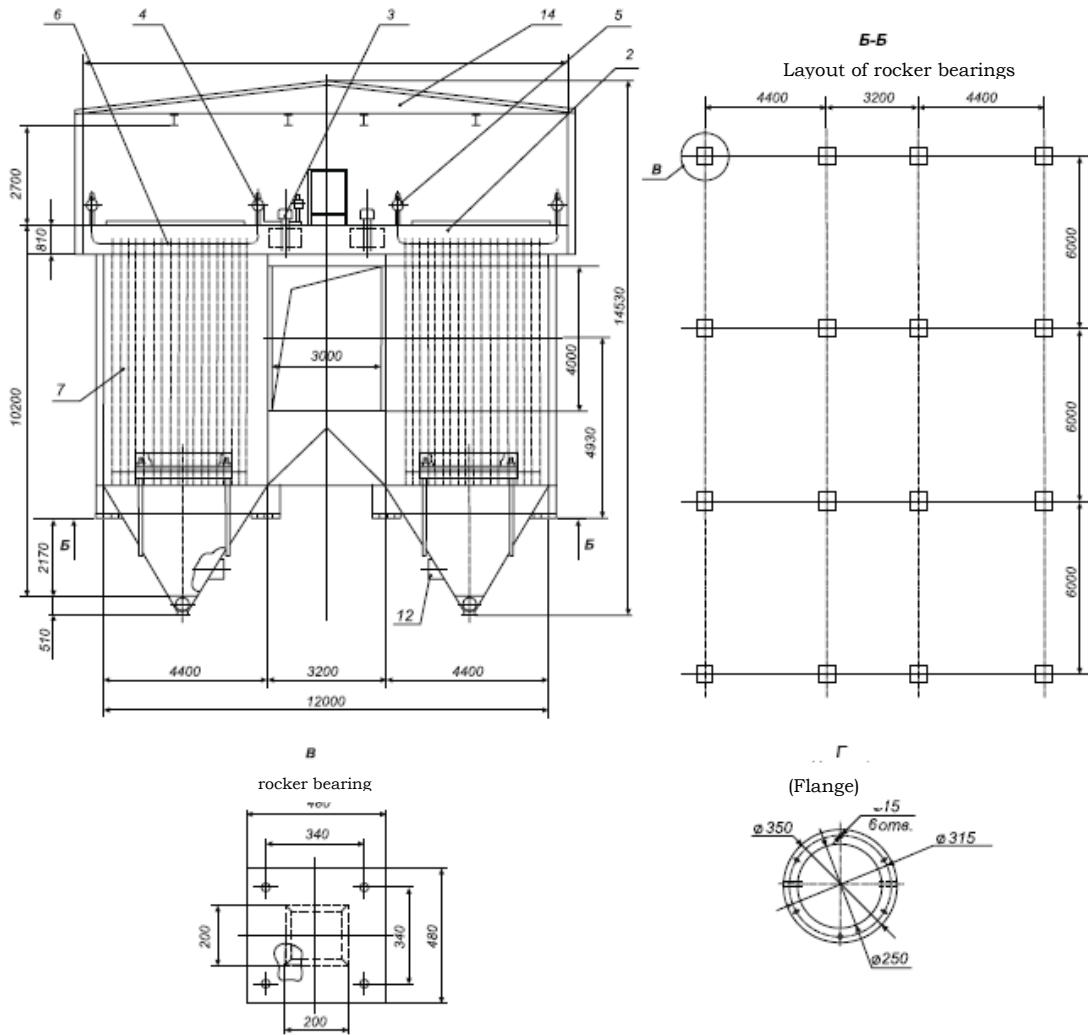


## Baghouse Components

- |                                      |  |
|--------------------------------------|--|
| 1. Housing                           | 8. Compressed air reduction system                     |
| 2. Clean gas compartment             | 9. Pneumatic dust shattering system                    |
| 3. Cut-off valve                     | 10. Pneumatic dust shattering compressed air collector |
| 4. Blow-down valve                   | 11. Lid  |
| 5. Cleaning compressed air collector | 12. Hatch  |
| 6. Distributing header               | 13. Dust discharge unit                                |
| 7. Bag filter                        | 14. Roof   |

**Note**

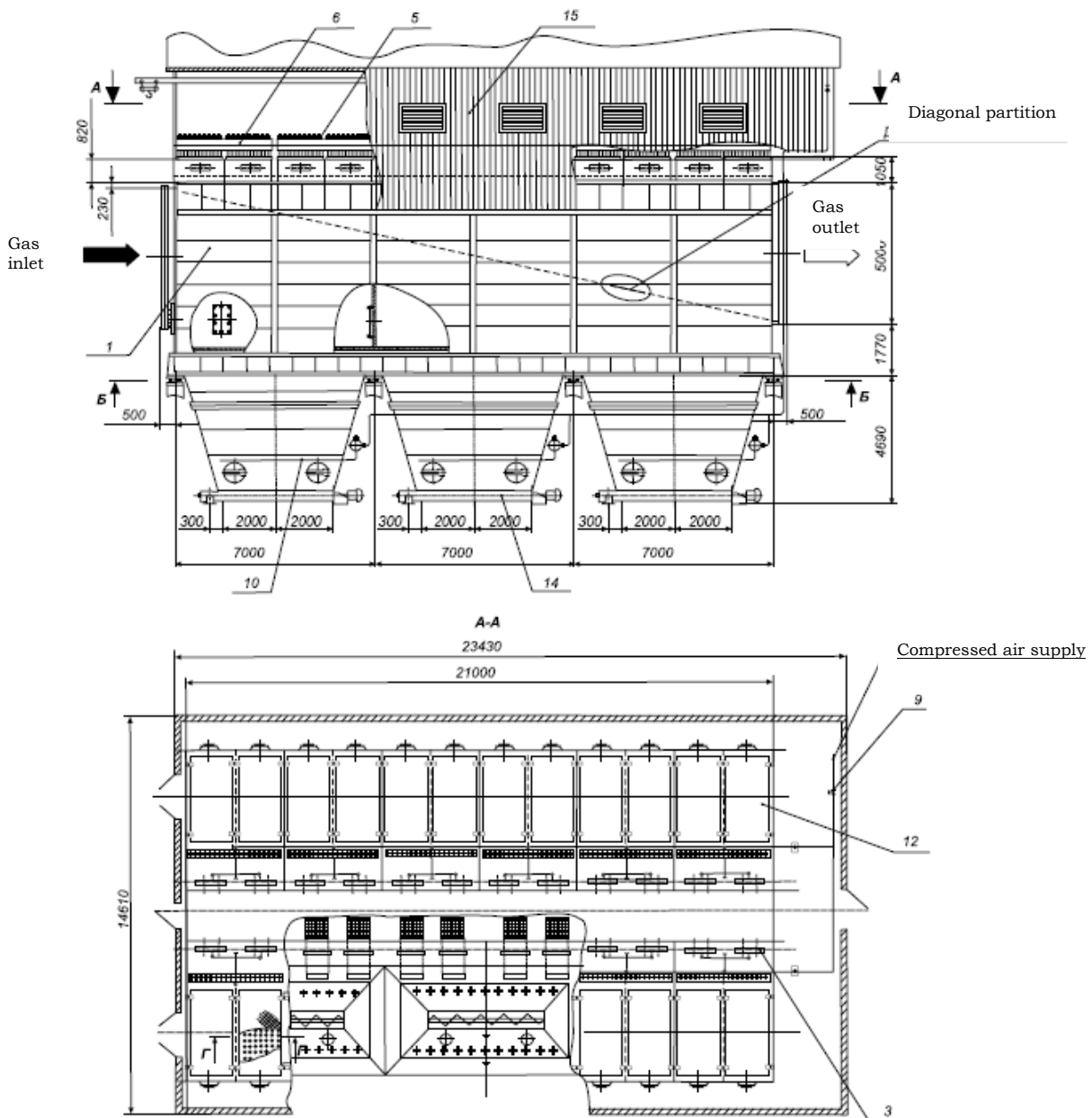
1. Gas inlet-outlet depends on position of diagonal partition and to be determined by process engineer in gas treatment facility design.
2. Dust discharge unit position shall also be determined by process engineer and may be installed in inversed manner.
3. Process engineer shall select dust discharge unit capacity on technical characteristics (see item 7)
4. Process engineer shall also determine type of dust level sensor , quantity and location in the hopper.



### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h	up to 710000
2. Filtering area, m <sup>2</sup>	7900
3. Number of bag filters, pcs	3024
4. Bag filter length, m	6,17
5. Baghouse mass, t	265
6. Compressed air flow rate, nm <sup>3</sup> /min, max	9
7. Dust discharge unit (screw-type):	
- motor power, kW	/0.75/1.1/1.5/2.2/
- screw speed, rev./min	/9/12.5/18/35.5/
- maximum capacity, m <sup>3</sup> /h	/2.2/3.0/4.3/8.6/

# FRIR - 9000

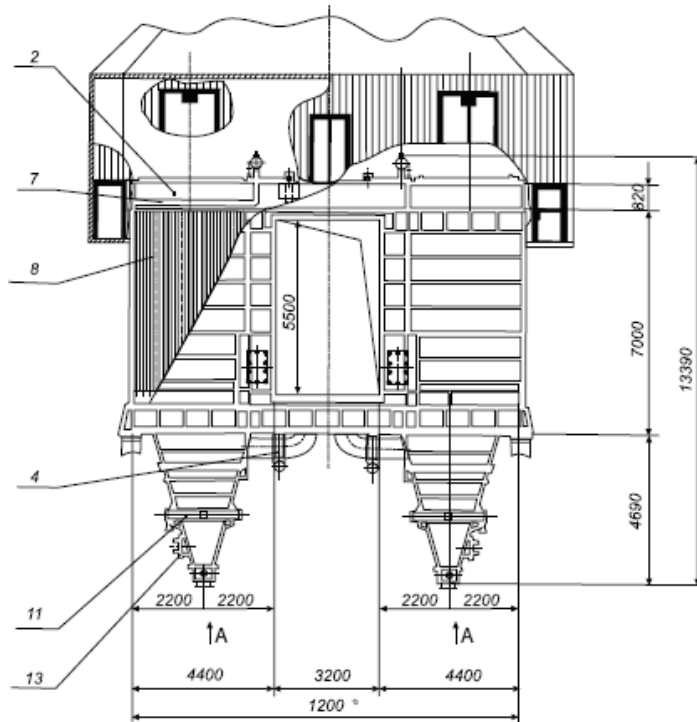


### Baghouse Components

- |                                      |  |
|--------------------------------------|--|
| 1. Housing                           | 9. Compressed air reduction system                     |
| 2. Clean gas compartment             | 10. Pneumatic dust shattering system                   |
| 3. Cut-off valve                     | 11. Dust pneumatic shattering compressed air collector |
| 4. Dirty gas cut-off valve           | 12. Lid  |
| 5. Blow-down valve                   | 13. Hatch  |
| 6. Cleaning compressed air collector | 14. Dust discharge unit                                |
| 7. Distributing header               | 15. Roof   |
| 8. Bag filter                        |  |

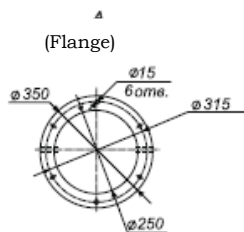
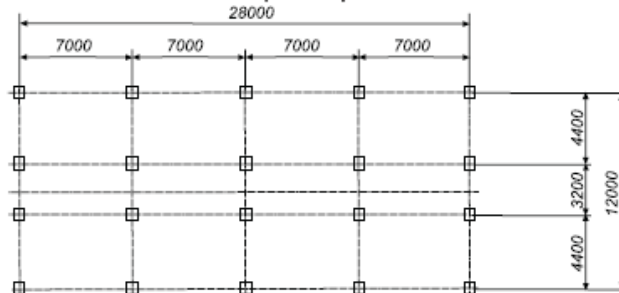
Note

- Gas inlet-outlet depends on position of diagonal partition and to be determined by process engineer in gas treatment facility design.
- Dust discharge unit position shall also be determined by process engineer and may be installed in inversed manner.
- Process engineer shall select dust discharge unit capacity on technical characteristics (see item 7).
- Process engineer shall also determine type of dust level sensor , quantity and location in the hopper.



B-B

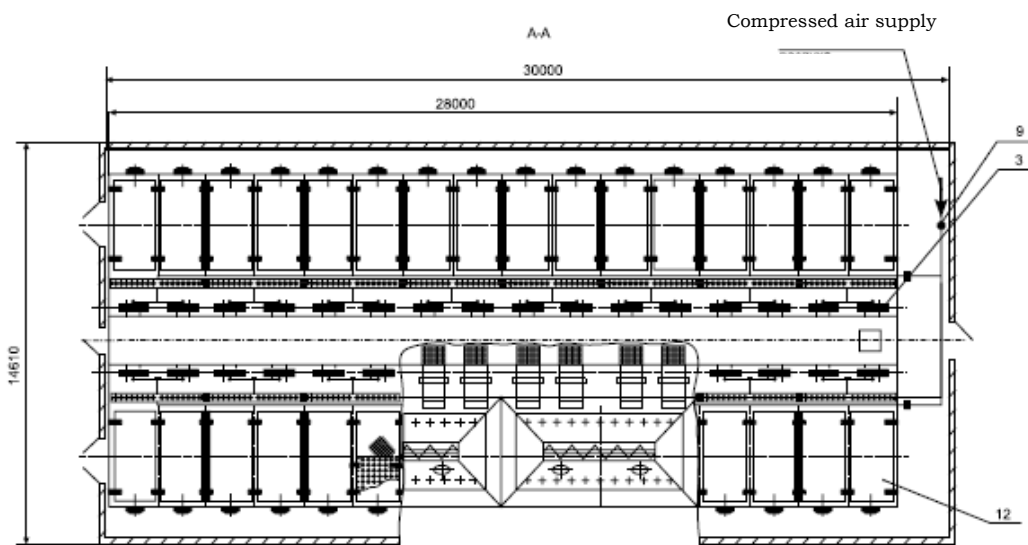
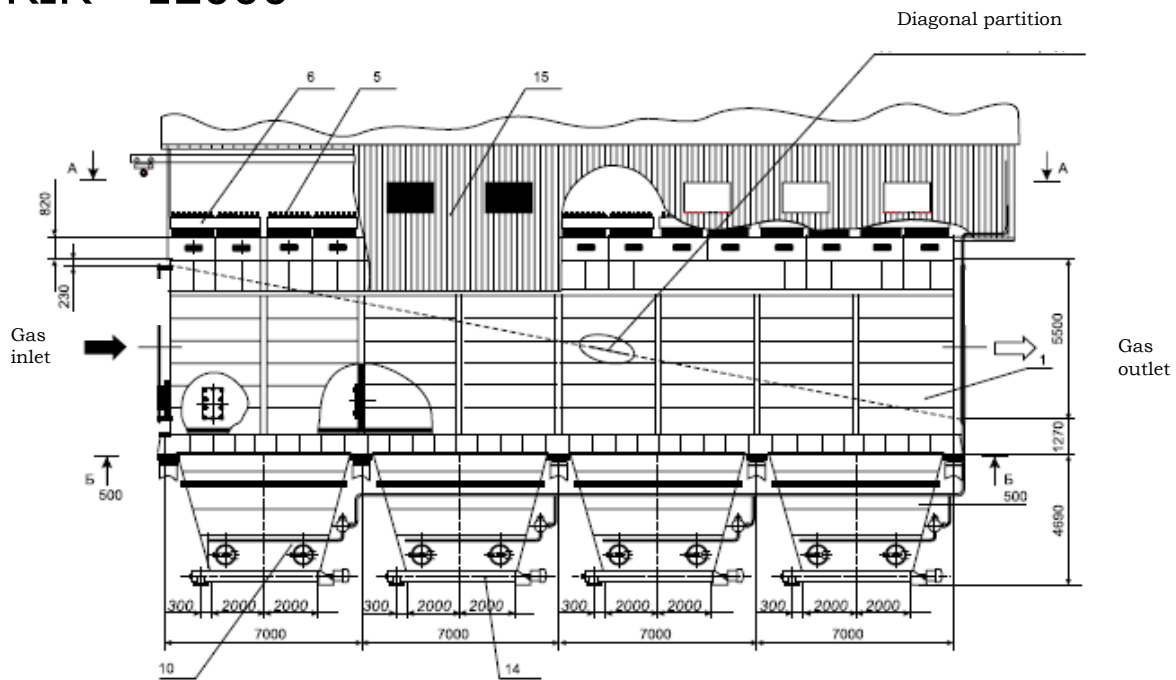
Layout of rocker bearings



### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h	up to 800000
2. Filtering area, m <sup>2</sup>	8790
3. Number of bag filters, pcs	3456
4. Bag filter length, m	6.3
5. Baghouse mass, t	252
6. Compressed air flow rate, nm <sup>3</sup> /min, max	9
7. Dust discharge unit (screw-type):	
- motor power, kW	/0.75/1.1/1.5/2.2/
- screw speed, rev./min	/9/12.5/18/35.5/
- maximum capacity, m <sup>3</sup> /h	/2.2/3.0/4.3/8.6/

# FRIR - 12000

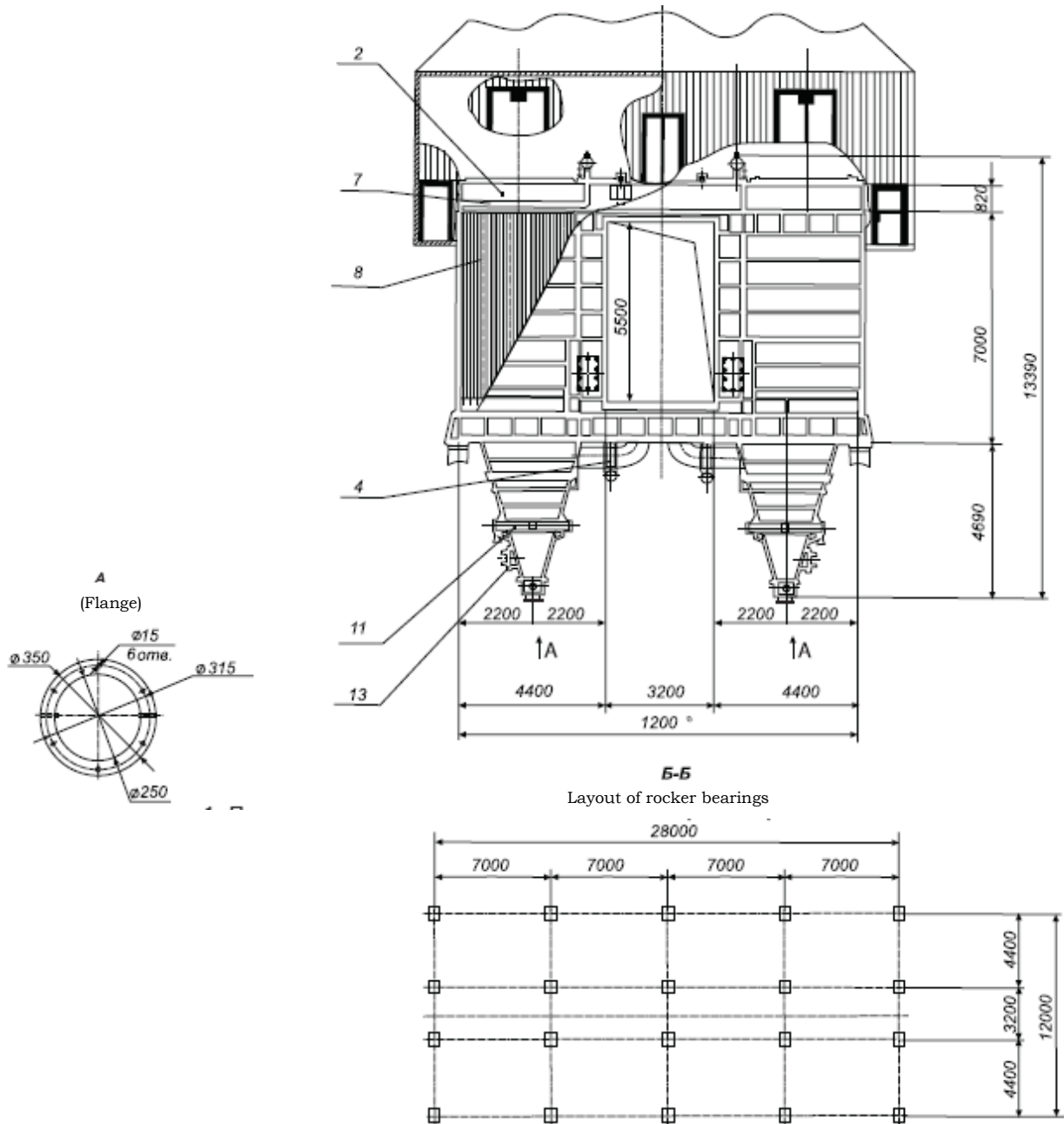


### Baghouse Components

- |                                      |  |
|--------------------------------------|--|
| 1. Housing                           | 9. Compressed air reduction system                     |
| 2. Clean gas compartment             | 10. Dust pneumatic shattering system                   |
| 3. Cut-off valve                     | 11. Dust pneumatic shattering compressed air collector |
| 4. Dirty gas cut-off valve           | 12. Lid  |
| 5. Blow-down valve                   | 13. Hatch  |
| 6. Cleaning compressed air collector | 14. Dust discharge unit                                |
| 7. Distributing header               | 15. Roof   |
| 8. Bag filter                        |  |

**Note**

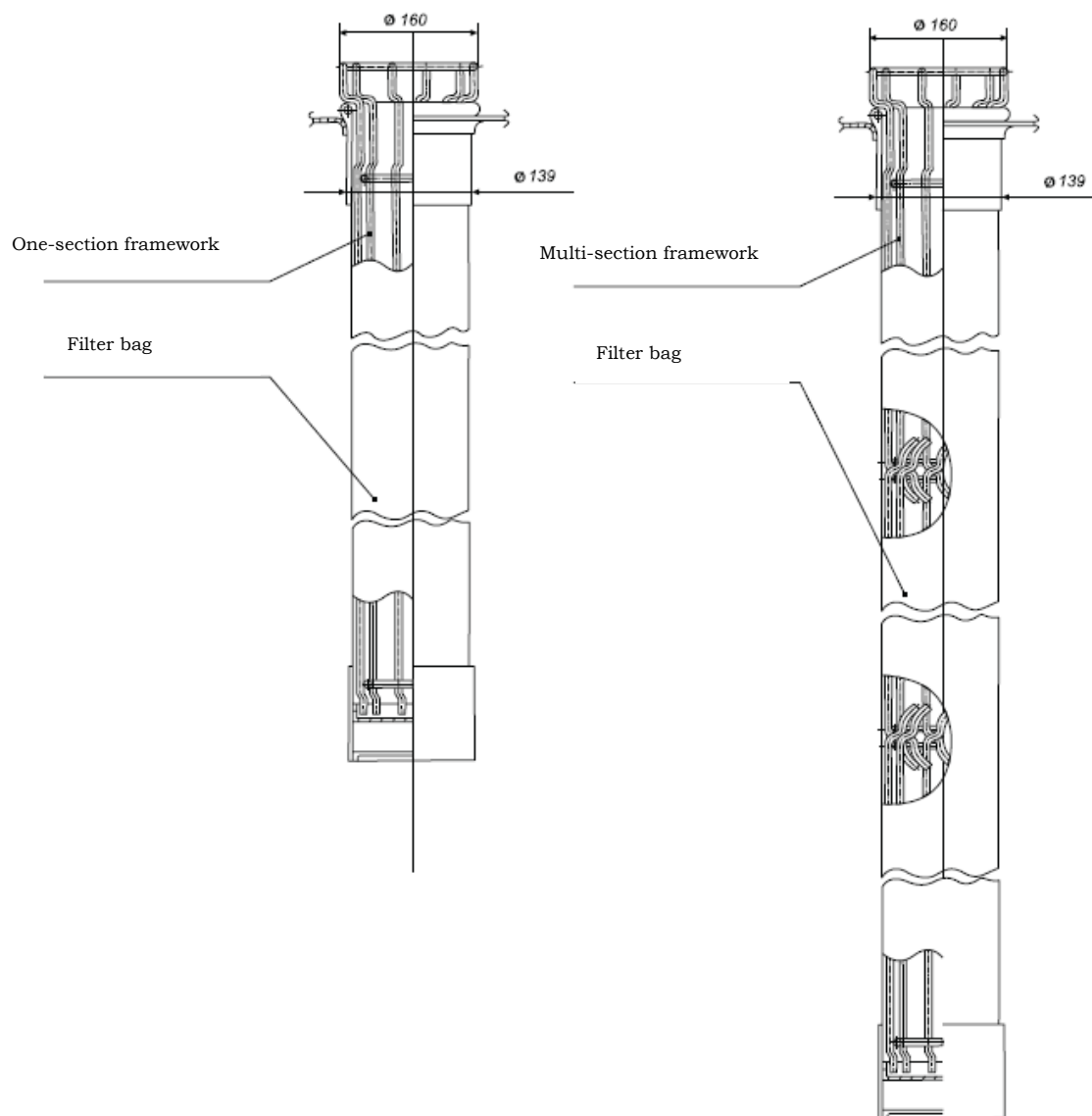
1. Gas inlet-outlet depends on position of diagonal partition and to be determined by process engineer in gas treatment facility design.
2. Dust discharge unit position shall also be determined by process engineer and may be installed in inversed manner.
3. Process engineer shall select dust discharge unit capacity on technical characteristics (see item 7).
4. Process engineer shall also determine type of dust level sensor , quantity and location in the hopper.



### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h	up to 1100000
2. Filtering area, m <sup>2</sup>	12000
3. Number of bag filters, pcs	4608
4. Bag filter length, m	6,28
5. Compressed air flow rate, nm <sup>3</sup> /min, max	9
6. Baghouse mass, t	332
7. Dust discharge unit (screw-type):	
- motor power, kW	/0.75/1.1/1.5/2.2/
- screw speed, rev./min	/9/12.5/18/35.5/
- maximum capacity, m <sup>3</sup> /h	/2.2/3.0/4.3/8.6/

# BAG FILTERS



# MAGNETICALLY-DRIVEN SHAKER BAGHOUSES (FREMIR)

These dust collectors are intended to remove fire-and explosion-safe medium and coarse dust from aspiration emissions. The baghouses may be applied in any industrial field, where technology provides generation of dust-laden gases and where application of baghouses utilizing compressed air is difficult or impossible.

The baghouse comprises a housing, mechanical and electrical outfit. The difference between the given dust collectors and pulse-jet baghouses is that filtering runs from the inside of the bag filter and clean gas leaves from its outside to be removed through pressure manifold of the baghouse. Compressed air is not used for cleaning.

Bag filters have a double-side attachment: on bottom bag plates and upper trunnions. Bottom fixed plate is a lid of the hopper, where entrapped dust is removed to after cleaning. Movable upper trunnion is rigidly connected to metal rod which runs to the core of magnetic coil located at housing top lid. Idle run of upper bag plate is 8-12 mm and is regulated in equipment adjustment.

Bags are clamped to the bottom plate. In maintenance, one may access the bags through special-purpose hatches located in dust collector housing.

The baghouses are cleaned as follows. Once the preset value of flow resistance is attained, a control signal is transmitted to cleaning system capacitor bank which generates a short-time high-power pulse, transmitted to solenoid coil provided on the housing. Received mechanical pulse generates an instantaneous reciprocating movement of upper trunnion. Generated oscillation is transferred to filter bags thus removing the layer of trapped dust. Pyramid or slotted hoppers make the bottom part of the housing. The hoppers end with flanges to receive rotary feeders or screw conveyors.

Baghouse mechanical and electrical outfit comprises: cleaning system electrical equipment, instrumentation and automation equipment, bag plates, filter bags, fasteners, pulse transfer mechanism and trunnion transfer mechanism.

Magnetic-pulse bag shaking is used in the baghouses for more efficient bag cleaning. Magnetic-pulse unit controls cleaning system mechanisms.

**Brief Technical Characteristics:**

1. Number of work channels – as per baghouse design
2. Supply voltage —220V 50Hz
3. Maximum consumed power – 0.8 kVA
4. Average consumed power, max. 100 W
5. Inductors are powered from pulse current generator rated from 0.4 to 2 kV (in pulse)
6. Baggouse is automatically operated 24/7
7. Average service life is min 10 years.

**Design and Operation**

The baghouse comprises a pulse current generator and K-inductors. Coil inductors are cabled to a corresponding channel of surge current generator.

Pulse current generator is designed as a dust-proof housing. The generator is intended to produce high-power current pulses and control actuators of cut-off valves. A bank of high-voltage capacitors is used as a pulse power source. In the course of regeneration cycle, inductors are alternately connected to the plates of high-voltage capacitor bank. As a result, the capacitor bank is discharged through the inductors, thus forming high-power electromagnetic pulses. Inductor-generated power is converted to mechanical power applied to filter bag trunnion. High-efficient cleaning is attained due to an initial acceleration higher than that of outdated camshaft gear, in filter bags moving. An option to control cut-off valves of filter sections is provided to additionally increase the cleaning efficiency.

The baghouse may operate both in automated and manual control modes.

Operation modes are switched over on front panel of pulse current generator.

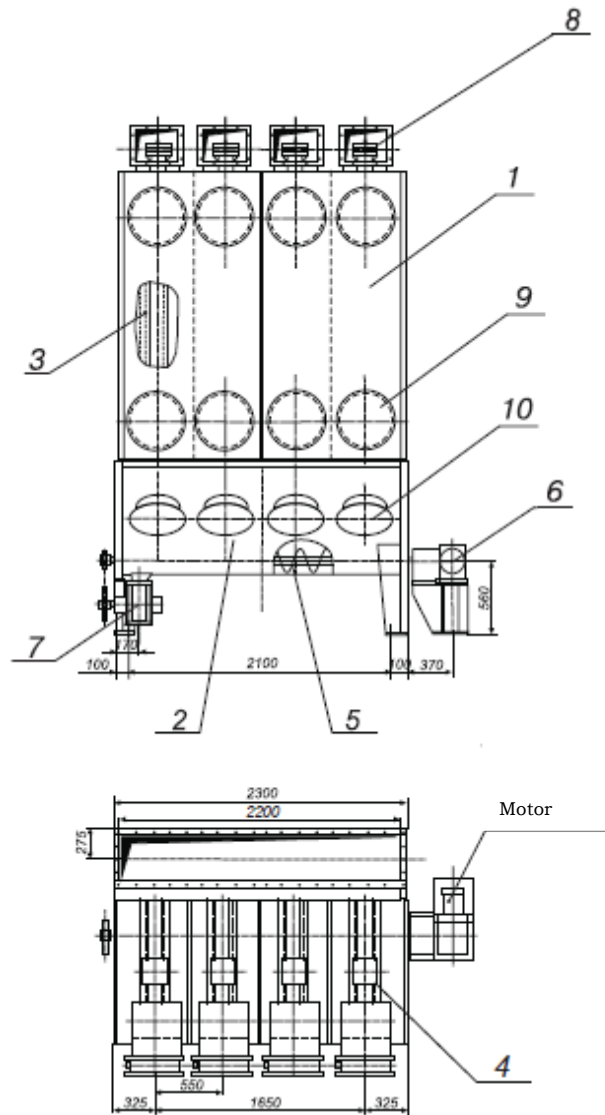
For operation convenience, an option for online changing of cleaning cycle parameters is provided by inputting new numeric values to control module located inside pulse current generator housing. Device setting and operation doesn't require any additional competency in electronics and programming.

Considering the peculiarities of FREMIR-series baghouse cleaning system, woven bags (i.e. made of lavsan) are only applied currently. Length of the bags is limited to 3 m. Thus, heat resistance of the bags and maximum temperature of treated gases is max 135°C. Input dust content shall not exceed 1 g/m<sup>3</sup>. Final dust content of treated gases is guaranteed to be 30 mg/m<sup>3</sup>, max.

Filter conventional designation:

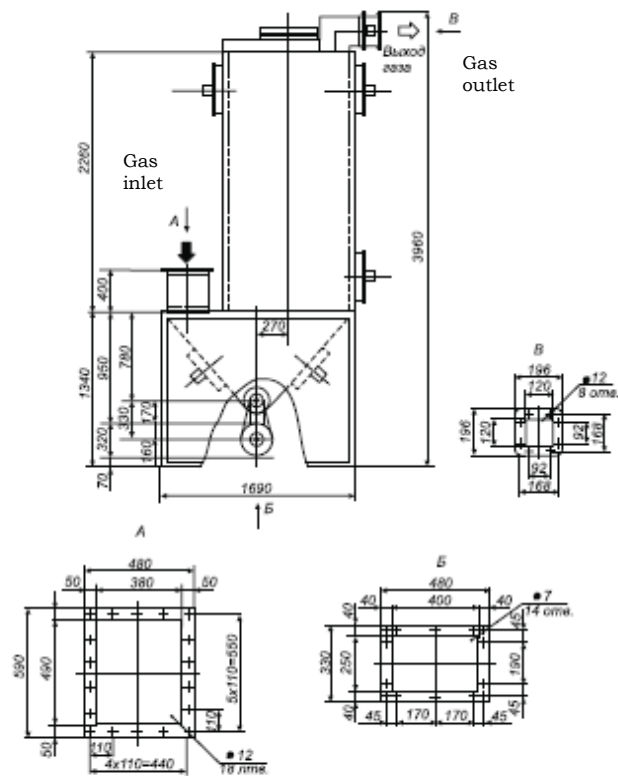
FREMIR – magnetically-driven shaker baghouse; numbers after letters specify the filtering area.

# FREMIR-60



## Baghouse Components

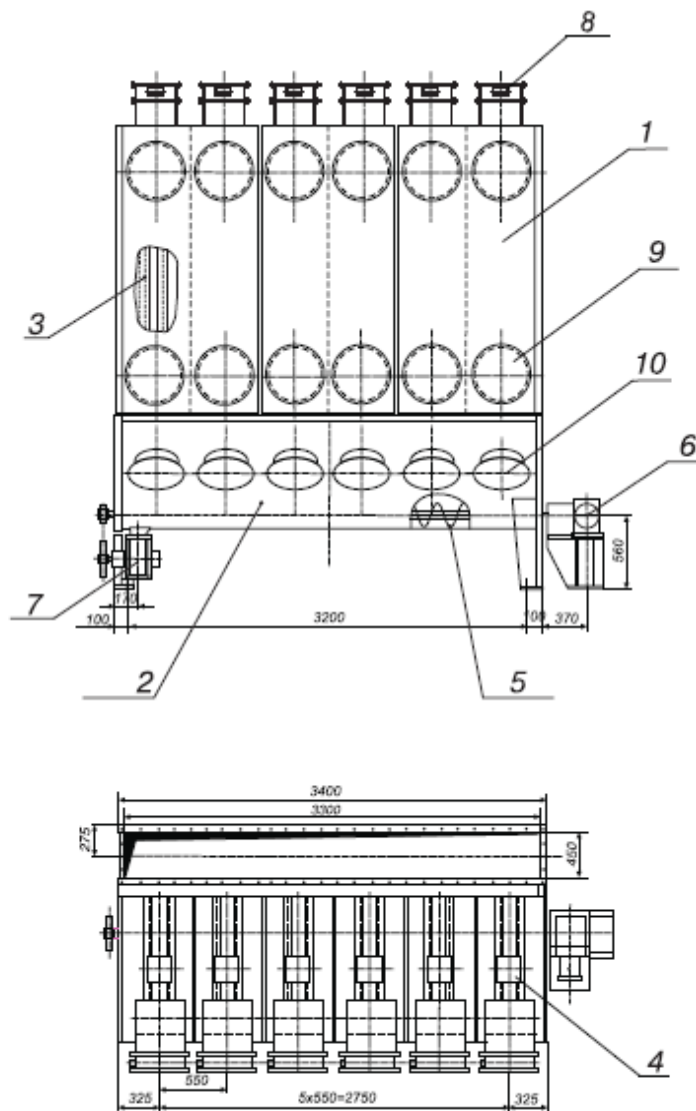
- |                         |                        |
|-------------------------|------------------------|
| 1. Housing              | 6. Screw drive         |
| 2. Hopper               | 7. Rotary-valve feeder |
| 3. Filter bag           | 8. Air damper          |
| 4. Cleaning inductor    | 9. Hatch DN-400        |
| 5. Dust discharge screw | 10. Hatch DN-250       |



### Technical Characteristics

1. Gas feed rate, m <sup>3</sup> /h, max	6700
2. Filtering area, m <sup>2</sup>	62,8
3. Inlet dust content, g/m <sup>3</sup>	10, max
4. Dust content at baghouse outlet, mg/m <sup>3</sup>	30, max
5. Bag filter flow resistance, Pa	900, max
6. Number of bag filters, pcs	72
7. Bag filter diameter, mm	135
8. Bag filter length, mm	2060
9. 4A71B4Y3 Drive motor, kW	0,75
10. Baghouse mass, kg	1650

# FREMIR-90



## Baghouse Components

- |                         |                  |
|-------------------------|------------------|
| 1. Housing              | 6. Screw drive   |
| 2. Hopper               | 7. Rotary feeder |
| 3. Filter bag           | 8. Air damper    |
| 4. Cleaning inductor    | 9. Hatch DN-400  |
| 5. Dust discharge screw | 10. Hatch DN-250 |



# RETROFITTING ELECTRIC FILTERS INTO BAGHOUSES

Currently, industrial enterprises use electric filters, having the efficiency which doesn't meet the modern requirements for treatment of process gases and aspiration air. The best practice to decrease final content of dust particles to values below  $20 \text{ mg/nm}^3$  is retrofitting of electric filters into baghouses.

Dneproenergostal develops both engineering solutions and projects including all the required disciplines to retrofit both horizontal and vertical electric filters into FRIR baghouses. Depending on peculiarities of process equipment operation, there are several options to retrofit the dust collectors:

I - (overhaul) – when there is a necessity to increase capacity of gas treatment facility up to 1.5 times: design of electric housing is changed, a system of automatically-operated cut-off valves, bags and frameworks is installed together with corresponding cleaning system. This option results in 50% rise of unit capacity, while target final dust content of  $20 \text{ mg/m}^3$  remains unchanged. This is the most expensive retrofit option, as most possible changes are introduced to the design of electric filter housing.

II – partial retrofit option, when there are almost no changes in housing design, only "clean" gas compartment, cleaning system, bag plates, bags and frameworks are changed correspondingly. Such retrofit option preserves the current capacity. This option is preferable for continuously operating filters. This option is less expensive in comparison with the previous one.

III – combined option. If process conditions allow decreasing of dust treatment system capacity (shutdown of some process equipment, or its redesign or retrofit), the least expensive option of existing electric filter retrofit is possible. This option will utilize all design solutions typical for FRIR baghouses. With this, filter capacity decreases by 20% to 30%.

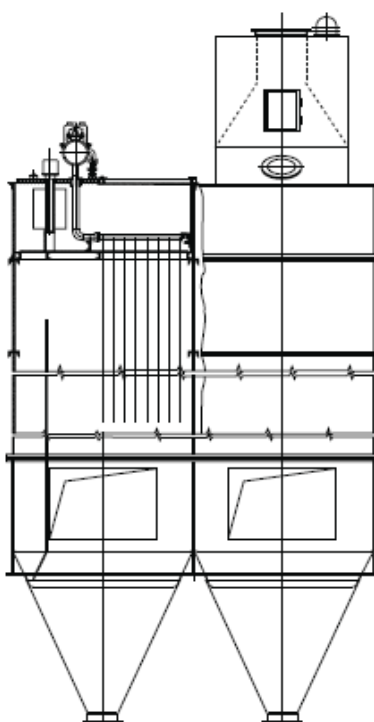


Fig. 1 Example of vertical electric filter retrofit

The absolute advantage of the above retrofit options is utilization of existing system of gas ducts, metalworks and dust removal system.

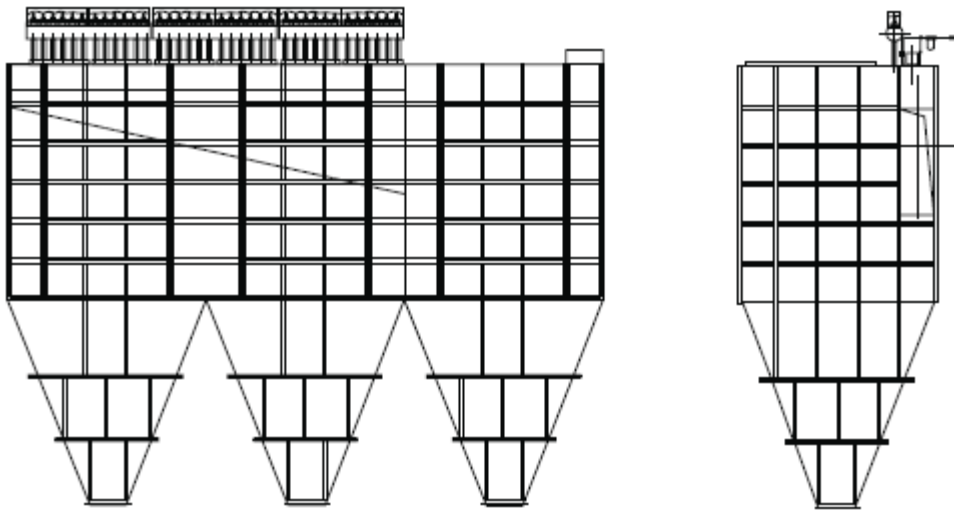


Fig. 2. Example of horizontal electric filter retrofit

Basic requirement for such works is that condition of electric filter housing metalworks meets the strength requirements for baghouses (corrosion or physical wear). In most cases, draft equipment should be changed due to equipment resistance growth, which results in significant rise in the cost of retrofit. This is the matter of critical importance. At the same time, calculations show the efficiency and high recoupage of capital investment, when we talk about dust as an intermediate or finished product.

# Water Treatment Facilities

## **UNIT TO COLLECT PETROLEUM PRODUCTS FROM WATER SURFACE**

The unit is applied for recirculation systems of industrial enterprises and closed reservoirs. In practice, our equipment may be used at any closed water surface contaminated with petroleum products as a result of continuous dumping or emergency leakage.

The proposed unit is intended for collection of petroleum products from water surface of settlers, clearing pools, collectors, natural reservoirs, etc. The equipment may be used at flow-through systems of liquid streamline flows. In such cases, the flow should be additionally dammed with oil-trapping units. If necessary, trapped oil products may be recycled.

Petroleum products are collected and vertically moved due to compressed air energy. Unit design allows collecting petroleum products from reservoirs with variable water level. Oil-and-gas mixture rises to a height of up to 10 meters, thus allowing collection of petroleum products from subsurface tanks. Viscosity of trapped substances is not regulated. The layer may have the least thickness, up to film spots. A two-step system of water separation allows receiving petroleum products with the least moisture content applicable for further processing.

The unit has a large capacity range, depending on lift height, air pressure, petroleum product viscosity and other parameters. Unit operation causes a sufficient increase in recycled water quality, allows removal of emergency consequences and provide collection and utilization of trapped products.

## **UNIT FOR USED EMULSION DECOMPOSITION (COOLING LUBRICANT)**

The unit is applied for productions where metal is machined by cutting using cooling lubricants. Cooling lubricant is a multicomponent system, basically intended for reduction of friction force when machining metal products and for decrease of metal temperature. Thus we improve the quality of machined surface and extend the service life of cutting tools.

Currently, used cooling lubricant emulsions are almost not utilized. Their removal and dumping are not advisable due to their relatively high toxicity and harmful effect on the environment.

Experts of Dneproenergostal developed the technology and correspondingly designed equipment to allow the decomposition of used cooling lubricants and extraction of petroleum products for further recycling. Decomposition residues are neutralized with reagents and dumped or recycled together with plant waste waters.

The proposed technology of cooling lubricant neutralization includes production of environmentally safe components and recycling possibility for products which compose cooling lubricants.

#### **UNIT FOR RECYCLING OF USED SALT SOLUTIONS FORMED IN CLEANING OF NA-CATION FILTERS**

Na-cation filters are applied at power facilities, particularly, for chemical preparation of boiler plants, applied at almost all combined heat and power plants and industrial enterprises with own boiler house. Operation of this equipment allows obtaining of softened water, free from magnesium and calcium ions which cause carbonate hardness of water. Utilization of such softened water sufficiently decreases quantity of scale in heat-exchangers.

Currently, a 8-10% solution of common salt is used to clean ion-exchange filters saturated with magnesium and calcium. After rinsing filter elements, solutions with high-chloride content are removed to treatment facilities or dumped to reservoirs, thus violating salt balance of natural waters. Experts of Dneproenergostal developed technology of common salt reduction for recycling in filter cleaning.

The proposed unit is intended to recycle common salt brine formed in sodium-cation filter cleaning to receive recyclable sodium chloride.

The method includes settling of hardness salt by treating brines with reagents under definite conditions. Obtained deposit is quickly to settle, it readily thickens and has high filtering properties. Magnesium and calcium carbonates obtained through this process may be used to neutralize acid effluents or as a component of deterging agents.

Unit implementation decreases chloride wastes by 30-40%. Brine recycling method is simple and practically feasible, it doesn't require major costs for capital construction and operation.

### **WATER PRESSURE FILTER WITH DOUBLE-LAYER ANTHRACITE-COAL AND QUARTZ FILLER**

The filter is used in circulating water supply systems of industrial enterprises. The filters are used for additional removal of suspended solids and petroleum products from effluents. Filter application at plants allows making of almost closed water-supply cycles with multiple usage of circulating water.

The proposed unit is intended to provide the required content of petroleum products and suspended solids in water, which cannot be obtained by using settlers. As a rule, discharge water contains over 50% of suspended solids below 5 µm and oil drops below 1.5 µm in diameter.

#### **FILTER BASIC TECHNICAL CHARACTERISTICS**

##### **Overall dimensions:**

diameter, mm	2000
height, mm	4700
Capacity, m <sup>3</sup> /h	150-170

##### **Suspended solids content:**

in source water, mg/l	up to 150
in filtrate, mg/l	1-15

##### **Oil content:**

in source water, mg/l	up to 30
in filtrate, mg/l	0.1 – 0.3

##### **Working pressure:**

working pressure (max), MPa	0.6
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Unit capacity and number of filters is individually selected for each application.

##### **Dneproenergostal offers:**

- development of engineering documentation for the proposed equipment;
- production of water filters with double-layer anthracite-coal and quartz filler;
- field supervision and equipment adjustment with issuing process charts;
- equipment maintenance.

## KEY COMPETENCES IN ENVIRONMENTAL AUDIT AND STANDARDIZATION:

- Development of standards of drinking water consumption for settlements.
- Development of individual reserve standards of water consumption and discharge for plants.
- Development of draft standards for maximum permissible discharge (MPD) of contaminants with effluents for companies and plants.
- Determination of waste water toxicity level based on biological testing.
- Calculation and agreement of solutions for special-purpose water applications.
- Environmental Audit of Ukrainian companies.

Our company has one of the best chemical and process laboratories in the region having accreditation certificate No. CE-10- 07 of August 22, 2007.

Environmental Audit as a new service became popular since 2004 in connection with issue of Ukrainian Law *On Environmental Audit*.

The necessity of environmental audit is caused by the lack of actual information about negative effect of plants on the environment.

Environmental Audit is a documented independent process of environmental audit object estimation which includes collection and objective appraisal of evidences to establish if definite activities, measures, conditions, environmental management system and related information meet the requirements of Ukrainian Laws on environmental protection and other criteria of environmental audit.

Environmental Audit may be carried out at plants, institutions and organizations, their branch offices and agencies or associations as a whole or related to their separate activities.

# ENGINEERING

## KEY DIRECTIONS AND TYPES OF WATER-RESOURCE ENGINEERING

Investigation of objects, preparation of materials for selection of ground area and Basic Engineering for development of design and estimate documentation.

Engineering and geodetic research of built-up and unbuilt areas with issuing layouts. Water survey and water-flow records. Water surveys and hydrology. Concurrent Engineering of facilities for water-resource, hydraulic and municipal applications:

- ponds and artificial reservoirs;
- cleaning of river beds, waterways and restoration of their hydraulic conditions;
- coast-protecting structures;
- water supply to settlements, industrial and municipal facilities;
- sewerage, water discharge, storm and waste waters;
- waste water treatment facilities;
- bioengineering treatment facilities;
- pumps stations;
- dewatering and protection of settlements, plants and agricultural areas from impounding and floods;
- operating observation network;
- industrial water supply and irrigation of agricultural areas and green plantings;
- dumps for solid domestic wastes;
- environment impact assessment.

## GENERAL CIVIL DESIGN

We have the following cost estimate software packages:

«**AC-4 PIR**» software allows to reliably estimate the cost of design works at the stage of estimated and agreed cost evaluation including labour content of design works (3-P form) in accordance with DBN D.1.1-7-2000 *Regulations for Cost Estimate of Design and Exploration Work for Construction in the territory of Ukraine*.

«**AVK-3**» & «**Smeta XXI**» software package are intended for automated issuing of estimate documents for capital construction, equipment erection, overhaul and construction works, repair of equipment, buildings and structures of mining and smelting enterprises, municipal equipment repair in accordance with DBN D.1.1-1-2000 *Regulations for Cost Estimate of Construction in the Territory of Ukraine*.

**Grand-Smeta** software package allows making cost estimates based on MDS 81-35.2004 *Cost Estimate Procedure for Construction in the Territory of the Russian Federation*.

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## DISINFECTION OF DRINKING WATER AND UTILITY FLUIDS

We carry out design works, contract supervision, start-up and adjustment works at the facilities for disinfection of drinking water and utility fluids with sodium hypochlorite.

Recently, sodium hypochlorite is started being used instead of liquid chlorine for disinfection of drinking water and utility fluids at water conduit and sewerage treatment facilities considering the high toxicity of chlorine to improve the treatment process safety.

A simplified version of the unit for disinfection of drinking water and utility fluids by sodium hypochlorite comprises a container with sodium hypochlorite and a metering pump.

For sophisticated processes, when a jump of disinfected liquid volume occurs, units for disinfection with sodium hypochlorite are additionally equipped with analysers of chlorine concentration and control devices for sodium hypochlorite feeding with metering pumps.

When retrofitting an existing chlorinator house, units for disinfection with sodium hypochlorite shall be located, as a rule, in the existing chlorine metering premises. Containers with sodium hypochlorite shall be stored in the existing storages for liquid chlorine containers.

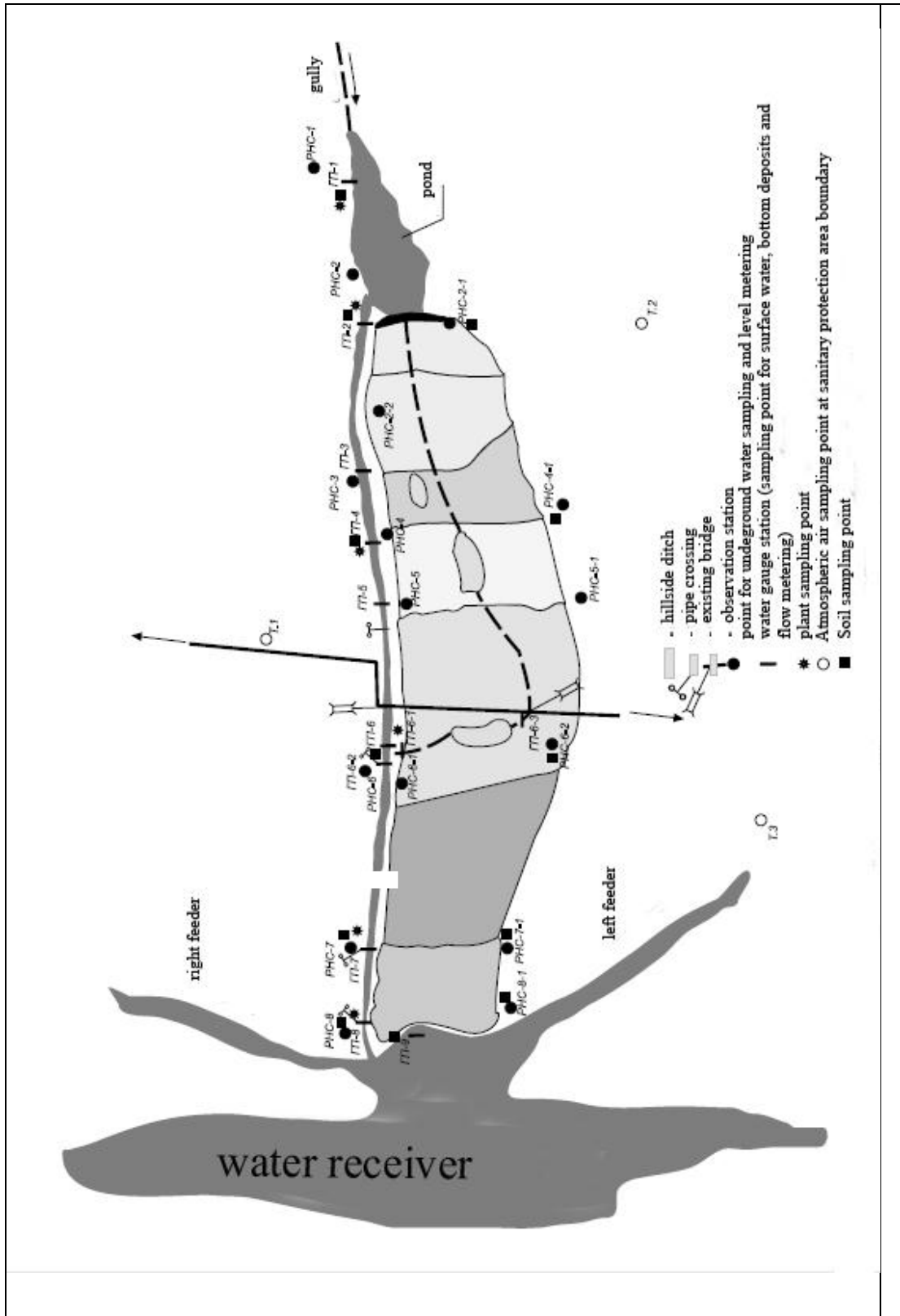
## ENVIRONMENTAL MONITORING

We carry out environmental monitoring in the area of anthropogenic impact on the environment and industrial areas, detect general and local regularities of possible contamination of environmental elements, estimate and predict the state of environmental elements and develop environment protection measures. We monitor the objects of industrial and anthropogenic impact, dumps of industrial and sanitary wastes and other areas in danger.

### **Basic directions and works performed in the course of monitoring:**

- Study of basic information about environment condition at objects to be monitored;
- Arrangement and outfit of base stations (hydraulic stations, observation wells, etc.);
- Geological engineering and hydrogeological survey;
- Monitoring investigation of ground water level, surface water flow and all types of depositions as well as plants and atmospheric air.
- Laboratory study of surface and ground water, soils, bottom depositions, plants and dumped components;
- Detection of dynamics of impact on environmental components;
- Predictive estimate of harmful impact and development of measures to reduce this effect on environment;
- Development of environmental protection management system for plants is based on ISO 14000 standards.

Monitoring results are used for the development of environment impact assessment, MPD, measures to eliminate harmful effect of anthropogenic facilities (measures to remove backwaters, anthropogenic reservoirs, impoundments, cleaning and restoring of preserved areas, collection and discharge of industrial waste waters, etc.).



# BIOENGINEERING STRUCTURES

## HOW TO USE CONTROLLED NATURAL SELF-PURIFICATION PROCESS EFFECTIVELY

Our company develops design and estimate documentation and constructs bioengineering structures. Bioengineering structures operate in natural conditions.

Bioengineering structures are a new class of water-protective structures, combining basic components of soil treatment facilities and biological ponds where higher aquatic vegetation is used.

### Design Features

Bioengineering structure is a reservoir of an arbitrary shape having a filtering filler (sand, crushed rock) in its base or sides for planting roots of higher aquatic vegetation (reed, macereed, rush, etc.) thereto. As a rule, the structures are cascade-shaped and include two or three bioengineering structures to provide a continuous process of nitrification-denitrification. Drainage of various types provides treated water flowing through tangled higher aquatic vegetation, root layer and filtering filler (see diagram of sewage water flow).

### Treatment Features

Bioengineering structures combine the following three components: roots, plants and microorganisms. The system operates by letting contaminated water flow below the surface of filtering layer through roots of higher aquatic vegetation in a specially designed structure. Root layer and microorganism provide required water treatment efficiency. As a result, we obtain water treated by natural processes, which meets the requirement of Ecological Standards.

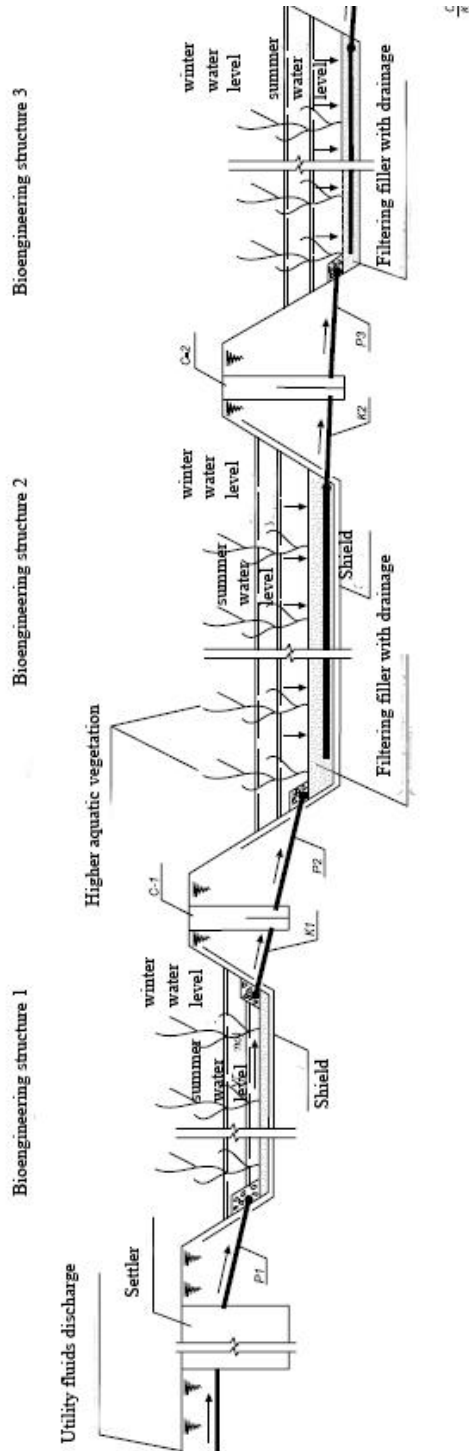
### Application

Treatment and final treatment of domestic sewage water in small settlements, agricultural and food production facilities, industrial enterprises, drain water of solid domestic waste dumps, hospitals, recreation facilities, etc. (capacity up to 500-700 m<sup>3</sup>/day). Treatment of surface run-off from the territory of industrial enterprises and residential communities.

### Efficiency of Contaminated Water Treatment

When passing through bioengineering structures, effluents with different composition undergo many physical and chemical transformations, the main of which are: adsorption-desorption, assimilation-dissimilation, oxidation-reduction, evapotranspiration. Oxygen feed occurs in the root area of higher aquatic vegetation. As a result, some substances are removed as gas (CO<sub>2</sub>, N<sub>2</sub>, H<sub>2</sub>, CH<sub>4</sub>, H<sub>2</sub>S), others are removed as solutions with treated water; some substances are removed with higher aquatic vegetation phytomass, and some remain in the structure. Operation of bioengineering structures is based on soil treatment procedures reliable in removing E-Coli bacteria. Bioengineering structures underwent laboratory and environmental tests, proving their ability to remove the following matters: ammonium ions, nitrate ions (efficiency: 60-90%); phosphates (efficiency: 20-60%); heavy metal ions (efficiency: 20-80%); suspended solids (efficiency: 96-98%); sulphate ions (efficiency: 25-30%); ions of sodium, calcium, magnesium (efficiency: 10-15%); petroleum products (efficiency: 20-90%); E-Coli bacteria, microalgae (efficiency: 96-98%); organic compounds based on COD and BOD (efficiency: 65-90%).

Diagram of Effluents Flow in Bioengineering Structures



# Questionnaire

## for Gas Treatment Equipment Supply

(to be filled by Customer or Designer)

No.	Questions	Data	Meas. units
1	Customer's Company name, legal address, name of CEO or person in charge, contacts (telephone number, fax, e-mail)		
2	Main processes (manufactured products, production line)		
3	Name of General Designer Company (contacts) and name of gas treatment facility designing company. Specify, if there is no design and its development is required		
4	Climatic conditions in construction area (minimum winter, maximum summer and annual average temperature, average barometric pressure)		
5	Brief description of the unit downstream of which the gas treatment facility shall be installed (retrofit)		
6	Specify off-gas volume (aspiration air) upstream of the facility under normal working conditions		Capacity, thou.m <sup>3</sup> /h
7	Off-gas temperature (specify temperature upstream of each facility and upstream of draft unit)		°C
8	Off-gas dust content upstream of baghouse		g/nm <sup>3</sup>
9	Maximum allowable negative pressure (pressure) of gases: <ul style="list-style-type: none"> <li>upstream of facility</li> <li>downstream of facility</li> </ul>		Pa Pa
10	Allowable flow resistance of facility		Pa
11	Off-gas chemical composition		%
12	Gas moisture content		g/m <sup>3</sup>
13	Dust characteristics: <ul style="list-style-type: none"> <li>bulk density</li> <li>angle of repose</li> <li>particle size composition</li> <li>dust physical properties (hygroscopic, caking property, abrasive ability, inflammability, etc.)</li> <li>chemical composition</li> </ul>		kg/m <sup>3</sup> deg.%
14	Requirements to gas treatment facility: <ul style="list-style-type: none"> <li>dust collector type</li> <li>maximum allowable final dust content</li> <li>automation level</li> <li>necessity in individual rood for baghouse (for outdoor installation)</li> </ul>		g/m <sup>3</sup>
15	Equipment working conditions (indoor/outdoor)		
16	Compressed air availability (pressure, flow rate)		atm., m <sup>3</sup> /min
17	Model and ratings of existing (designed) draft unit (fan, smoke exhauster, etc.)		

Peron completing the Questionnaire, name, position

# Services

## **AIR BASIN PROTECTION**

- Inventory of emission sources at plants and certification of existing gas treatment facilities. Recommendations to improve their efficiency.
- Design of facilities of various capacity to treat gas and dust emissions, including neutralization of chemical compounds, (NO<sub>x</sub>, SO<sub>2</sub>HCl, etc.).
- Design of systems to localize gaseous emissions and their preliminary preparation. Design of gas samplers for various process equipment.
- Testing of gas treatment equipment, issuing of parameter charts, process instructions, start-up diagrams, certificates and other process documentation.
- Field supervision over gas treatment facilities, maintenance and routine maintenance.

## **WATER BASIN PROTECTION**

- Optimization of existing water treatment facilities operation, their certification, design and issuing of parameter charts.
- Development of Environment Impact Assessment for Basic and Detailed Engineering.
- Development of projects for maximum permissible discharge of effluents to water basins.
- Water-Resource Engineering
- Design and construction of bioengineering treatment facilities
- Disinfection of drinking water and effluents with sodium hypochlorite
- Environmental monitoring in industrial area.
- Arrangement and outfit of base stations (hydraulic stations, observation wells, etc.).
- Geological engineering and hydrogeological survey.
- Complete chemical analysis of effluents and issuing of summary report.

## **RECOVERABLE UTILITIES**

- Survey of water basins containing recoverable utilities, recommendations for their use.
- Design, construction, field supervision and maintenance of waste-heat utilization plants of various design and capacity (to obtain steam, hot water, preheated air, etc.), evaporative cooling systems of industrial facilities.
- Certification and implementation of all the necessary standards and technical documents for power generating units such as boilers, boilers of waste treatment facilities, turbines, etc.
- Ecological and combustion testing of fuel utilizing equipment, it's adjustment, issuing of parameter charts, including agreement in state control bodies.
- Design, construction, testing, mounting and adjustment of burners of various types.