



MINISTRY OF EDUCATION AND SCIENCE
NOVOSIBIRSK STATE UNIVERSITY OF ARCHITECTURE AND CIVIL
ENGINEERING (SIBSTRIN)

CHAIR OF WATER SUPPLY SYSTEMS

DEVELOPMENT OF TECHNOLOGY FOR CLEANING DOMESTIC WASTEWATER DISCHARGED INTO LAKE BAIKAL

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GOAL:

- DEVELOPMENT OF TECHNOLOGY THAT WILL ALLOW TO PROVIDE DEEP CLEANING OF DOMESTIC WASTEWATERS.

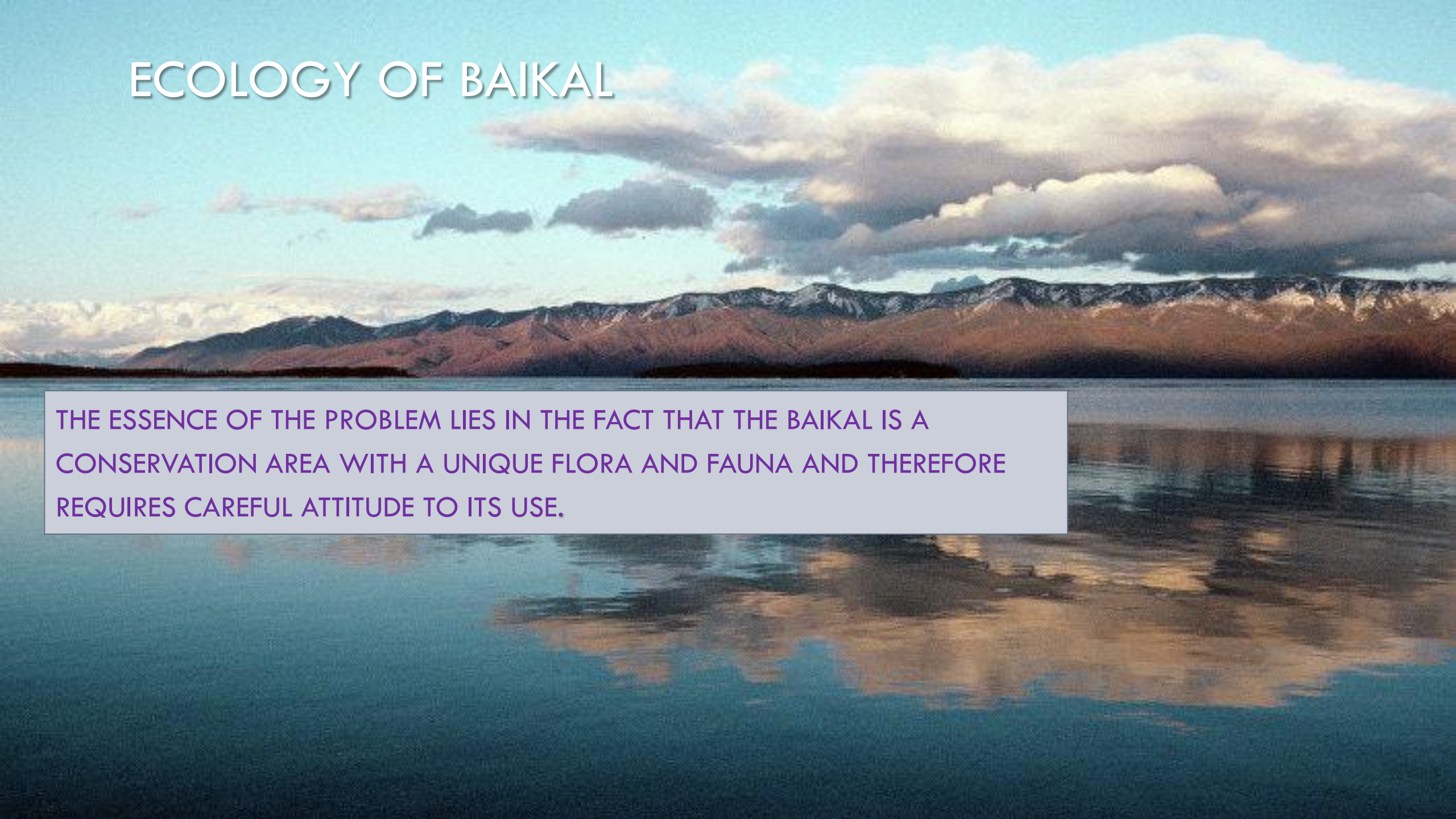
OBJECTIVES:

- MAKE LITERARY REVIEW OF THE SCIENTIFIC THESIS THEME;
- DEVELOP DRAWINGS FOR AN EXPERIMENTAL SETUP;
- ASSEMBLY, PUT INTO OPERATION EXPERIMENTAL SETUP;
- CONDUCT RESEARCH ON:
 - ARTIFICIAL WASTEWATER;
 - NATURAL WASTEWATER.

SCIENTIFIC SIGNIFICANCE:

- THE RESULTS OF THE WORK CAN BE IMPLEMENTED IN SEWAGE TREATMENT FACILITIES DESIGNED TO CLEAN HOUSEHOLD WASTE DISCHARGED INTO UNIQUE WATER BODIES.

ECOLOGY OF BAIKAL

A wide-angle photograph of Lake Baikal. The water is a deep, clear blue, reflecting the sky and the distant mountains. The sky is filled with large, white and grey clouds, some of which are illuminated by a warm, golden light, suggesting either sunrise or sunset. In the background, a range of rugged mountains stretches across the horizon, their peaks partially covered in snow or light-colored rock. The overall atmosphere is serene and majestic.

THE ESSENCE OF THE PROBLEM LIES IN THE FACT THAT THE BAIKAL IS A CONSERVATION AREA WITH A UNIQUE FLORA AND FAUNA AND THEREFORE REQUIRES CAREFUL ATTITUDE TO ITS USE.

THE PURITY OF WATER IN THE BAIKAL IS MAINTAINED BY THE ACTIVITY OF A MICROSCOPIC EPISHURA CRAYFISH HAVING A SIZE OF 1.5 MM, WHICH CLEANS THE LAKE WATER FROM ORGANIC IMPURITIES WHEN THE WATER PASSES THROUGH ITS BODY. THE OMUL IS THE OBJECT OF NUTRITION FOR THE BAIKAL SEAL. THIS ENDEMIC OF THE BAIKAL PLAYS AN IMPORTANT ROLE IN THE LAKE'S ECOSYSTEM, INHABITING THE ENTIRE WATER COLUMN AND FORMING UP TO 90% OF THE RESERVOIR BIOMASS. ABOUT 2,600 SPECIES AND SUBSPECIES OF AQUATIC ANIMALS ALSO INHABIT BAIKAL, MANY OF WHICH ARE ALSO ENDEMICS.



RUSSIA РОССИЯ

Basin of rivers discharging water to Baikal



оз. Байкал

уда

Селенгинск

Улан-Удэ

Хилок

Темник

Джида

оз. Хубсугул

Эгийн-Гол

Дэлгэр-Мурэн

Идэр

Селенга

Сухэ-Батор

Чикой

Менза

Орхон

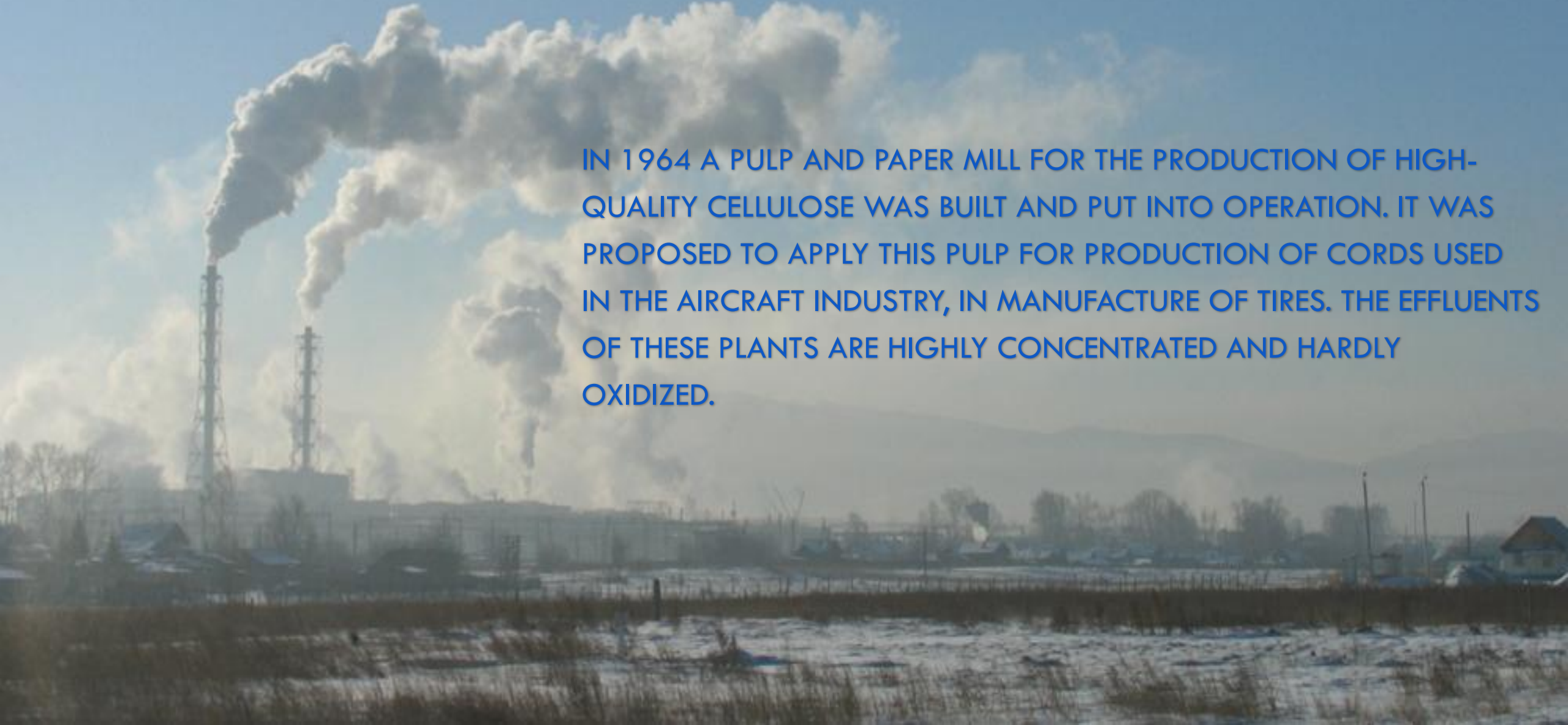
Туул

УЛАН-БАТОР

МОНГОЛИЯ
MONGOLIA

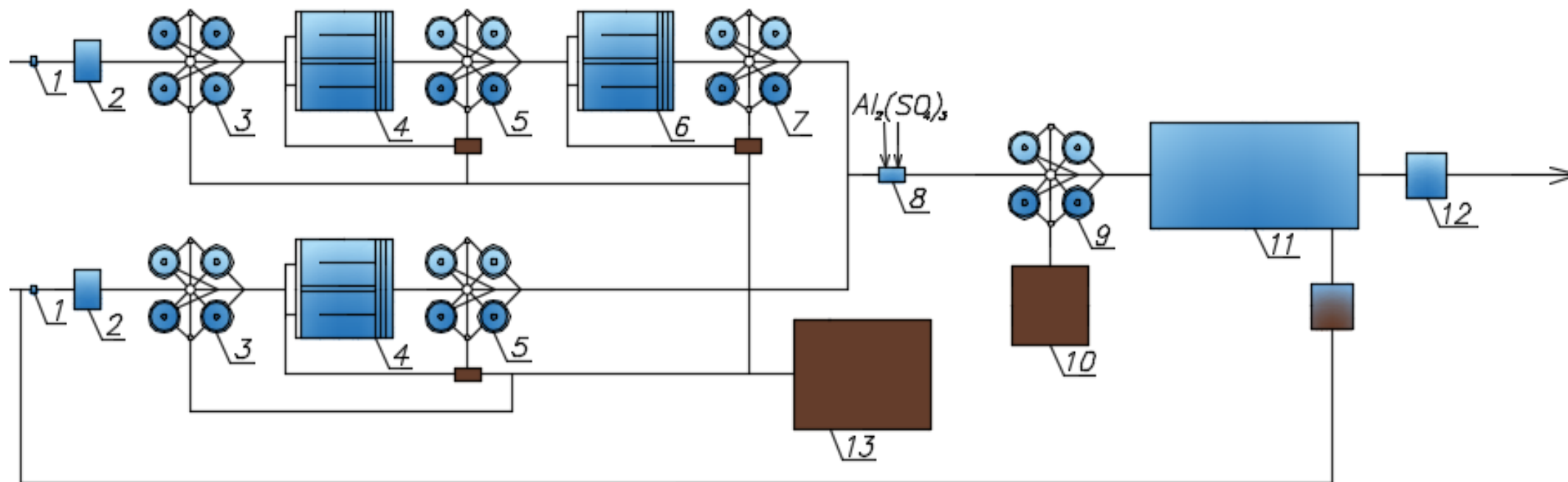
PULP AND PAPER INDUSTRIAL ENTERPRISE

IN 1964 A PULP AND PAPER MILL FOR THE PRODUCTION OF HIGH-QUALITY CELLULOSE WAS BUILT AND PUT INTO OPERATION. IT WAS PROPOSED TO APPLY THIS PULP FOR PRODUCTION OF CORDS USED IN THE AIRCRAFT INDUSTRY, IN MANUFACTURE OF TIRES. THE EFFLUENTS OF THESE PLANTS ARE HIGHLY CONCENTRATED AND HARDLY OXIDIZED.



TECHNOLOGICAL SCHEME OF LOCAL TREATMENT FACILITIES AT THE PULP AND PAPER INDUSTRIAL ENTERPRISE

БПКполн - 750-1500 мг/л,
взвешенные вещества - 350-500 мг/л



BODtotal - 350-500 мг/л,
suspended material- 400-600 мг/л

- 1 - receiving chamber; 2 - mechanical cleaning building; 3 - the primary clarifier; 4 - 1-stage aerotank;
5 - secondary settling tank; 6 - 2-stage aerotank; 7 - tertiary settling tank; 8 - reaction chamber;
9 - physico-chemical cleaning tank; 10 - sediment receiver for physical and chemical cleaning;
11 - building filters; 12 - clean water reservoir; 13 - storage of organic sludge.

EXPERIMENTAL INSTALLATION



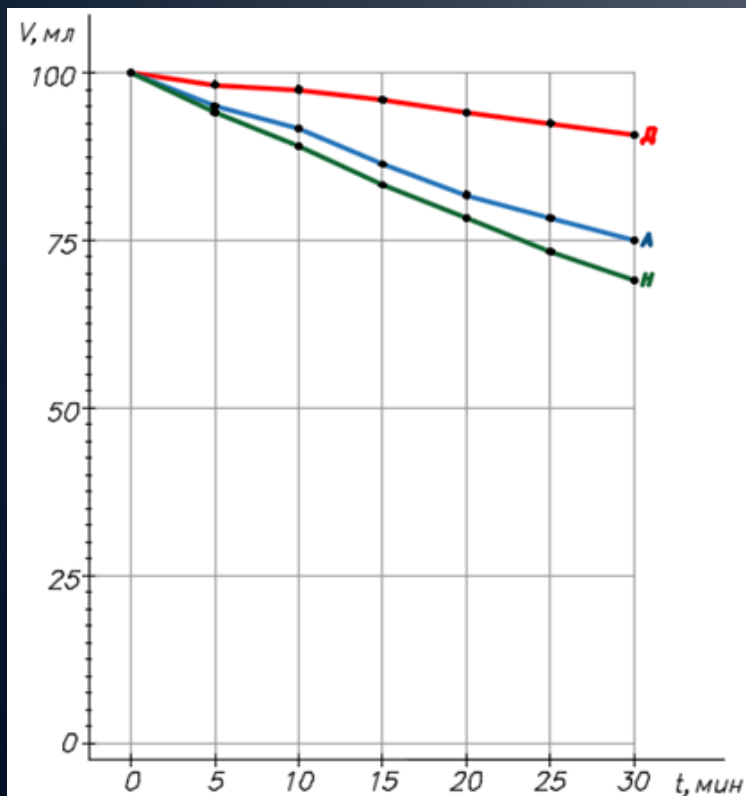
- 1 - regulator tank;
- 2 - denitrifier zone;
- 3 - aerotank zone;
- 4 - nitrification zone;
- 5 - tank for removal of wastewater;
- 6 - engine (before reconstruction);
- 7 - engine (after reconstruction);
- 8 - the bottom of the denitrifier sealed with a sealant.



SLUDGE MIXTURE INDICATORS

Zone	Volume, ml	Sludge dose, g	Sludge index, l/g
Denitrification	640	4,68	138
Aerotion	670	4,68	138
Nitrification	730	4,11	178

Sedimentation curve



№	Показатель	Значения показателей исходной сточной жидкости
1.	ХПК, мг/л	189
2.	Фосфор (по Р), мг/л	5,7
3.	Азот аммония (по N), мг/л	15,6
4.	Нитриты (по N), мг/л	следы
5.	Нитраты (по N), мг/л	следы
6.	Сульфаты, мг/л	32,1
7.	Хлориды, мг/л	30,5
8.	Активная реакция (pH)	7,1
9.	Температура, °C	25

Д – в денитрификаторе; А – в аэротэнке; Н – в нитрификаторе

HYDROBIOLOGICAL ANALYSIS

Cathypna luna

Refers to the simplest of the highest trophic level. Their presence at the beginning of the experiment shows that the activated sludge was delivered from a well-functioning aerotank

Nematode



This species develops little in good active sludge, because they prefer stagnant zones. Therefore, their large number may indicate insufficient aeration of activated sludge, or its poor mixing.

Euplotes charon



They die in heavily polluted run-off, so their presence characterizes the good performance of biofilters and aeration tanks.

Vorticella convallaria



Their appearance meant that the activated sludge was slightly overloaded on organic pollution and indicated the lack of oxygen.

Opercularia coarctata



Philodina roseola



Their appearance means a high quality of wastewater treatment, a developed nitrification process, a sufficient level of oxygen in the liquid and satisfactory salinity of sludge.

ANALYZES OF WASTEWATER FROM EACH ZONE

№	Показатель	Значения показателей в зонах		
		Денит	Аэрот	Нитриф
1.	ХПК, мг/л	94,2	115	90,3
2.	Фосфор (по Р), мг/л	17,8	18,4	17,1
3.	Азот аммония (по N), мг/л	0,048	0,047	0,047
4.	Нитриты (по N), мг/л	0,037	0,058	0,02
5.	Нитраты (по N), мг/л	21,6	22,6	22,6
6.	Сульфаты, мг/л	61,4	82,9	56,5
7.	Хлориды, мг/л	23,5	31,6	30,1
8.	Активная реакция (рН)	7,12	7,13	7,15
9.	Температура, °С	24	25	25

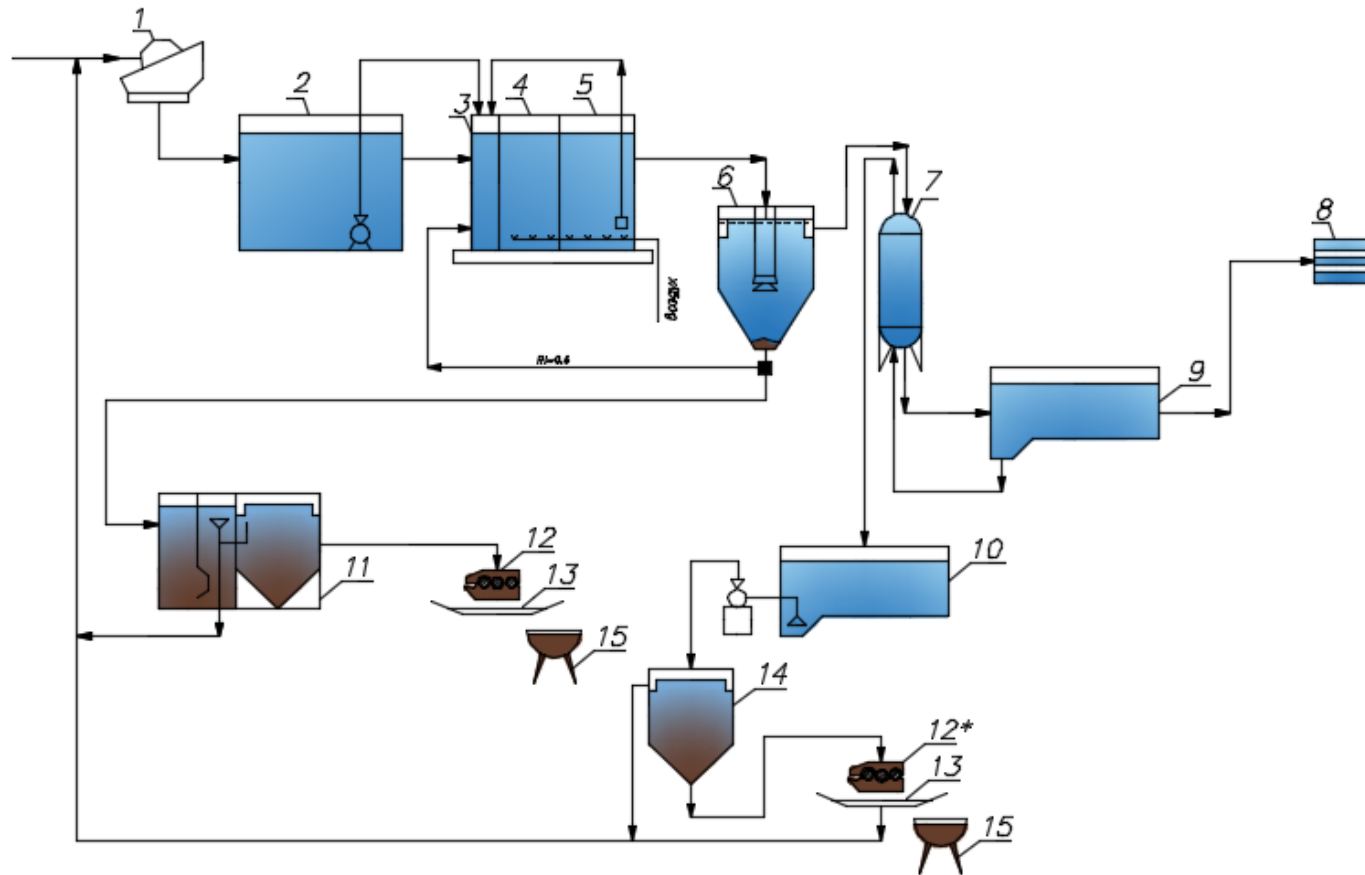


OLKHON ISLAND

ОЛХОН ОУГД



TECHNOLOGICAL SCHEME OF THE COMPACT INSTALLATION FOR THE VILLAGE OF HOZHIR, OLKHON ISLAND



- 1 – drum membrane;
- 2 - reservoir-averager;
- 3 - denitrification zone;
- 4 - aerobic zone;
- 5 - nitrification zone;
- 6 - secondary settling tank;
- 7 - fast filter;
- 8 - UV;
- 9 - clean water reservoir;
- 10 - dirty water reservoir;
- 11 - aerobic stabilizer;
- 12 - filter press for organic sludge;
- 12 * - filter press for crystalline sediment;
- 13 – trough for the filtrate collection;
- 14 - separator for crystalline sediment;
- 15 - crystalline sediment;

INDICATORS OF WASTE LIQUID OF THE VILLAGE HUZHIR, OLKHON ISLAND

НА ВХОДЕ:		НА ВЫХОДЕ:	
BODcomplite	250 мг/л	BODcomplite	3 мг/л
Suspended material	200 мг/л	Suspended material	1 мг/л
Ammonium nitrogen	25 мг/л	Ammonium nitrogen	0,4 мг/л
Phosphorus	6 мл/л (по Р)	Phosphorus	0,2 мл/л (по Р)
T in winter	15 °C	T in winter	15 °C
T in summer	20 °C	T in summer	20 °C
pH	7,5	pH	7,5

THANK YOU FOR ATTENTION

