DEZAVID™
NEW GENERATION DESINFECTANT

At present, due to the growing population density,the spreading centralized water supply, and the increasing water body pollution, the problem of water disinfection (decontamination) has taken on social implication. According to the data of World Public Health Organization, about 500 million people suffer yearly from waterborne diseases.

Currently the most widely used types of decontamination are: a) UV-disinfection of water; b) percolation by means of membrane filters with pore size of 0.01 μm; c) ozone treatment; and d) disinfectant treatment (by chlorine and its derivative substances). All above-enumerated types have got grave disadvantages: they do not ensure supply system secondary bacterial pollution level (a), purification on a large scale is expensive (b), they are too sensitive to substance content and concentration in water (c), or have cancerogenic effect (d) (it is ascertained that atomic chlorine emerging in the disinfection process, when combined with organic substances, form toxic compounds, apparently undesirable for getting inside human organism).

Considering the necessity of creating a disinfectant meeting strict ecological, safety, effectivity, durable-action requirements without changing decontamination technology of purification plants, and capable of replacing the existent reagents used nowadays, Russian specialists have created and patented the Dezavid™ compound possessing all the above-mentioned properties, which has demonstrated it effectiveness in the course of decontaminating: drinking and natural water, pool water, city industrial sewage, equipment cooling systems, open-ended heat-supply system hot water, and also pipeline and construction protection from pathogenic bacteria and fouling (biological overgrowing), as well as for medical decontamination and disinfection of railway, water, and automobile transport, child care, public catering, and food industry facilities.

The basis of **Dezavid** compound are organic polymers **Polysept (polyhexamethylene guanidine hidrochloride)** and **Catamyne AB (alkyl dimethyl benzil ammonium cloride) –** well water-soluble bactericidal polyelectrolytes based on guanidin compounds, which kill both gram-positive and gram-negative bacteria. Moreover, these polymers have properties of a cathyon-type flockulant, which leads to enlargement of the polluting particles – and therefore provides higher quality of filtration and results in higher purity of water.

Dezavid™ compound was tested in Ecological Water Monitoring, Analysis and Conditioning Laboratory of the State Unitarian Enterprise "Mosvodokanal Research Project Institute" and also in Medical Microbiology and Parasitology Laboratory of "A.N.Syssin Research Institute of Human Ecology and Hygiene of Environment of Russian Academy of Medical Sciences".

The aim of testing was estimating the **Dezavid™** effectiveness for decontamination of **drinking water, natural water and sewage .**

1. In the course of testing **Dezavid**™ was used for producing **drinking water** out of water taken from River Moscow in different seasons. Optimal doses of **Dezavid**™ were found according to such parameters as heterotrophic bacteria plate count - HPC (standard sanitary representative sample of heterotrophic organism group), and coli-index.

The total number of bacteria in water was estimated by finding how many mesophilic, mesotrophic, and facultative aerobes from 1 cub. cm water sample were able to grow in culture medium at 37^0 C during 24 hours, making colonies visible at 2 – 5 –fold magnification.

Dezavid™ bactericidal efficiency was estimated as compared to that of chlorine and sodium hypocloride. In compliance with RF Sanitary Regulations, river water decontamination effect is observed at the compound dose of 0.4 mg/l, and the virtually complete 100% inactivation of such microorganisms as HPC, GCB (general coliform bacteria), TCB (thermotolerant coliform bacteria), staphylococcus, salmonella, cali protobes, Pseudomonas Aeruginosae, sulfite reducing clostridial bacteria occurred at the compound dose of 1.5 mg/l. Wherein the required decontamination level with the use of chlorine is attained at 3 – 4 mg/l and with the use of sodium hypocloride is observed at 2 – 2.5 mg/l.

Comparative bactericide efficiency of disinfecting agents: Dezavid, chlorine, and hypochloride in producing drinking water (Moscow River case)

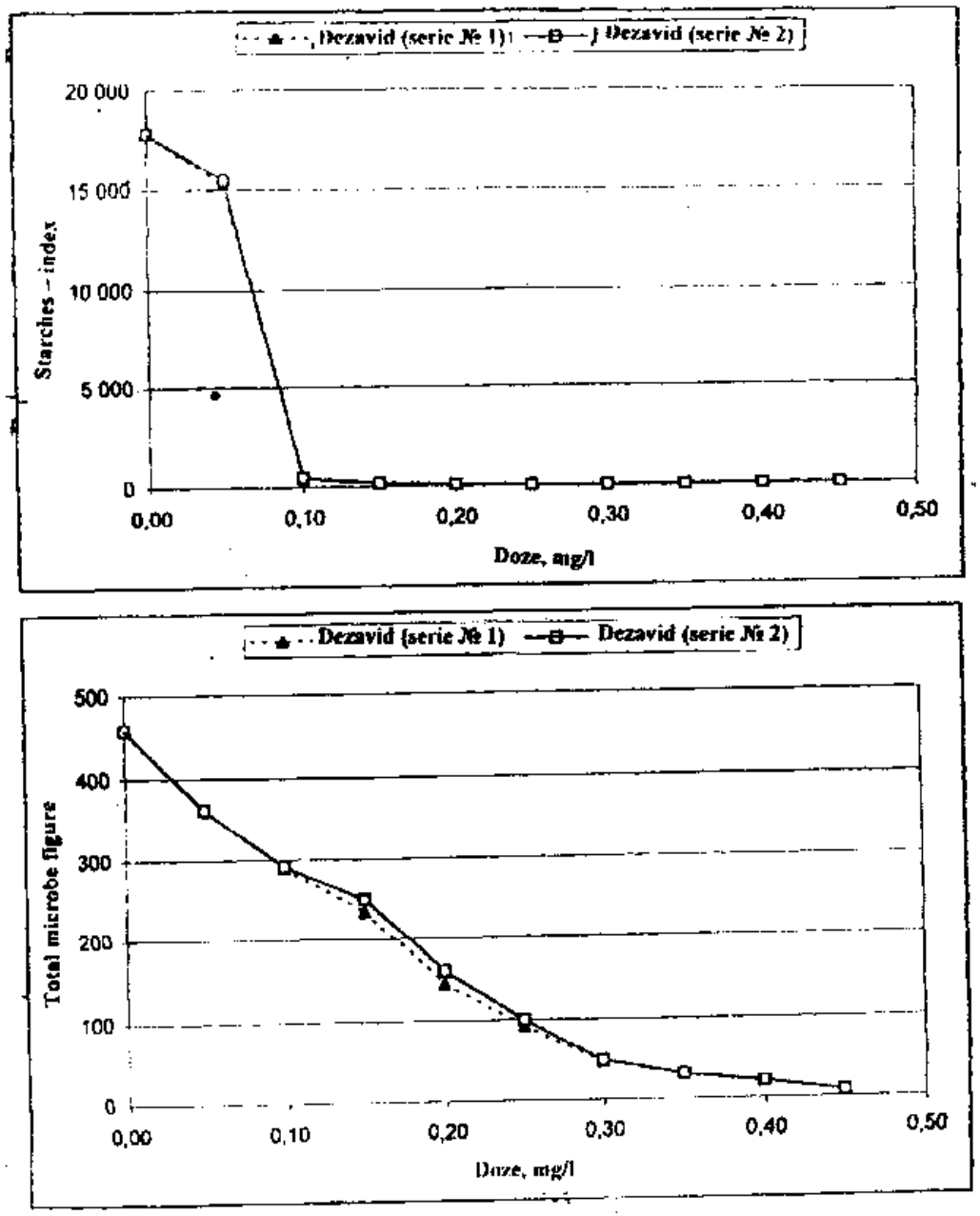
HPC – Heterotrophic bacteria Plate Count

Col/ml – Number of colonies per 1 ml

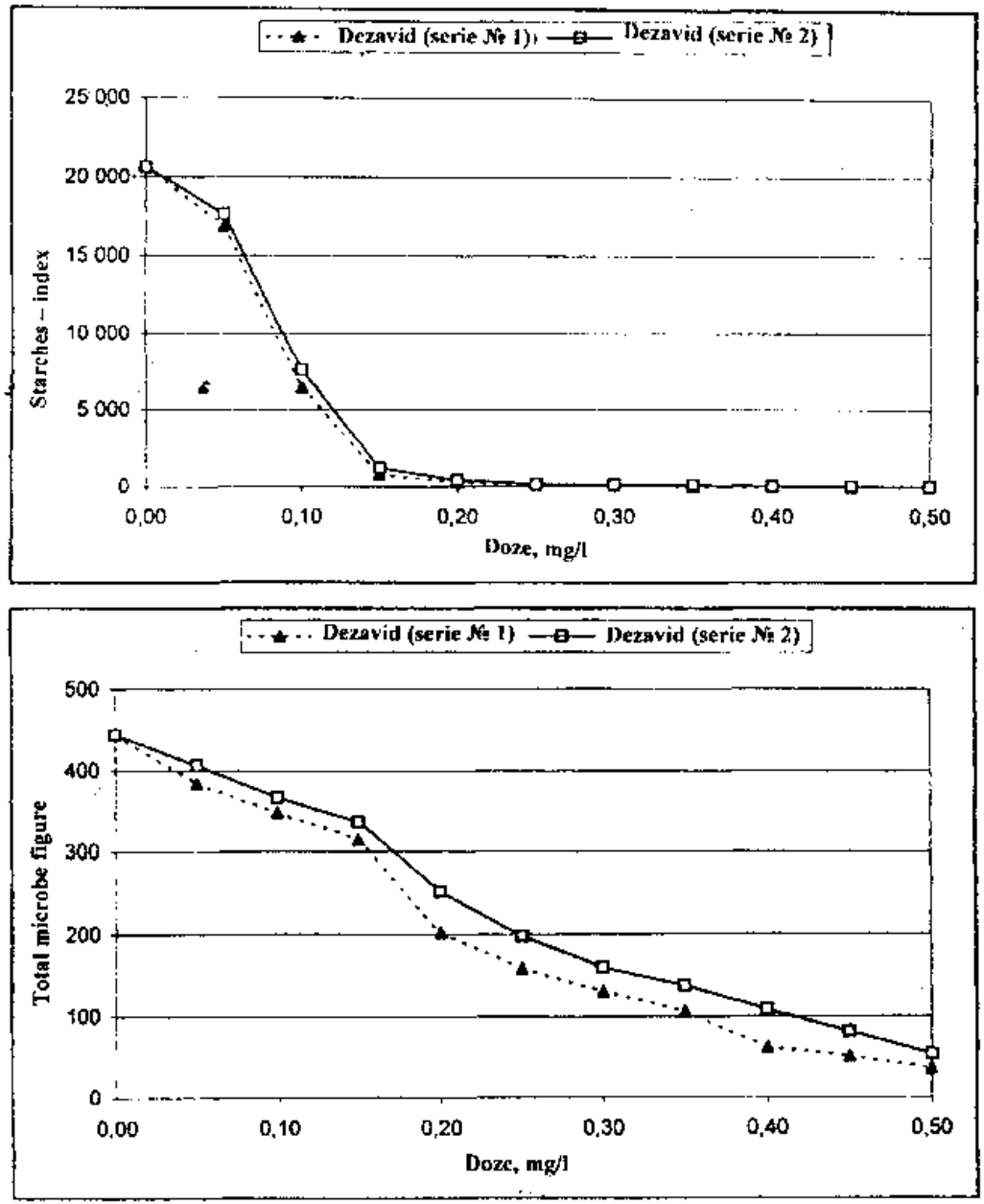
Date	Dose, mg/ l	HPC, col/ ml	Coli-index	HPC, col/ ml	Coli-index	Dose, mg/ l	HPC, col/ ml	Coli-index	HPC, col/ ml	Coli-index
		Dezavid, Series 1		Dezavid, Series 2			Chlorine		Hypochloride	
01.11.2000	**0,0**	410	16100	410	16100	**0,0**	410	16100	410	16100
	0,05	320	14900	300	13500	**0,5**	270	4800	280	2940
	0,1	310	320	290	300	**1,0**	100	250	90	110
	0,15	287	106	272	85	**1,5**	80	180	45	25
	0,2	205	59	193	39	**2,0**	43	20	28	<3
	0,25	140	37	115	15	**2,5**	42	3	13	<3
	0,3	53	<3	40	<3	**3,0**	35	<3	10	<3
	0,35	36	<3	23	<3	**3,5**	14	<3	8	<3
	0,4	17	<3	13	<3	**4,0**	13	<3	7	<3
14.11.2000	**0,0**	430	16800	430	16800	**0,0**	430	16800	430	16800
	0,05	310	13520	335	14950	**0,5**	290	5 100	230	2-300
	0,1	296	325	314	336	**1,0**	128	290	100	
	0,15	275	91	292	118	**1,5**	85	195	40	8
	0.2	198	40	215	65	**2,0**	52	25	23	<3
	0,25	117	20	146	40	**2,5**	45	6	20	<3
	0,3	41	<3	58	<3	**3,0**	36	<3	16	<3
	0,35	24	<3	37	<3	**3,5**	15	<3	12	<3
	0.4	15	<3	18	<3	**4,0**	13	<3	10	<3
15.11.2000	**0,0**	380	20000	380	20000	**0,0**	380	20000	380	20 000
	0,05	350	15300	337	14900	**0,5**	320	9000	290	3 100
	0,1	240	990	215	910	**1,0**	287	870	93	150
	0,15	160	700	146	675	**1,5**	265	600	139	10
	0,2	90	290	82	263	**2,0**	240	210	28	<3
	0,25	70	80	63	75	**2,5**	195	65	20	<3
	0,3	35	28	32	25	**3,0**	150	20	15	<3
	0,35	23	<3	20	<3	**3,5**	120	<3	10	<3
	0,4	15	<3	14	<3	**4,0**	60	<3	10	<3
	0,45	8	<3	8	<3	**4,5**	40	<3	8	<3

Date	Dose, mg/ l	HPC, col/ ml	Coli-index	HPC, col/ ml	Coli-index	Dose, mg/ l	HPC, col/ ml	Coli-index	HPC, col/ ml	Coli-index
		Dezavid, Series 1		Dezavid, Series 2			Chlorine		Hypochloride	
24.11.2000	**0,0**	490	17650	490	17650	**0,0**	490	17650	490	17650
	0,05	380	15700	400	16500	**0,5**	300	9500	265	3 100
	0,1	270	320	310	400	**1,0**	120	140	96	87
	0,15	155	85	260	100	**1,5**	96	120	41	10
	0,2	90	36	180	42	**2,0**	55	22	20	<3
	0,25	60	10	110	18	**2,5**	46	5	15	<3
	0.3	50	^3	60	<3	**3,0**	36	<3	12	<3
	0,35	27	<3	35	<3	**3,5**	15	<3	10	<3
	0.4	20	<3	26	<3	**4,0**	12	<3	10	<3
27.11.2000	**0,0**	510	17920	510	17920	**0,0**	510	17920	510	17920
	0,05	370	15000	406	16800	**0,5**	330	9780	240	3250
	0,1	280	350	330	410	**1,0**	130	250	70	90
	0,15	250	90	275	107	**1,5**	100	138	45	8
	0,2	100	40	174	46	**2,0**	60	25	37	<3
	0,25	75	15	97	20	**2,5**	48	4	19	<3
	0,3	45	<3	58	<3	**3,0**	37	<3	12	<3
	0,35	33	<3	39	<3	**3,5**	13	<3	10	<3
	0,4	26	<3	30	<3	**4,0**	12	<3	10	<3
29.11.2000	**0,0**	530	18400	530	18400	**0,0**	530	18400	530	18400
	0,05	440	17000	396	16200	**0.5**	310	9900	280	4300
	0,1	348	430	292	363	**1,0**	105	265	96	210
	0,15	280	115	257	95	**1,5**	93	140	75	70
	0,1	178	47	108	43	**2,0**	56	22	39	<3
	0,25	93	25	68	14	**2,5**	41	6	24	<3
	0,3	55	<3	47	<3	**3,0**	34	<3	20	<3
	0,35	42	<3	32	<3	**3,5**	12	<3	15	<3
	0.4	28	<3	26	<3	**4,0**	10	<3	12	<3

Date	Dose, mg/ l	HPC, col/ ml	Coli-index	HPC, /ml	Coli-index	Dose, mg/ l	HPC, /ml	Coli-index	HPC, /ml	Coli-index
		Dezavid, Series 1		Dezavid, Series 2			Chlorine		Hypochloride	
06.12.2000	**0.0**	555	19500	555	19500	**0,0**	555	19500	555	19500
	0,05	406	16380	450	17300	**0,5**	353	9980	330	4380
	0,1	310	430	350	470	**1,0**	160	270	150	220
	0,15	220	100	300	126	**1,5**	125	154	106	146
	0,2	100	50	185	50	**2,0**	67	30	38	27
	0,25	70	10	146	20	**2.5**	49	10	27	<3
	0,3	45	<3	59	<3	**3,0**	29	<3	20	<3
	0,35	30	<3	38	<3	**3,5**	25	<3	18	<3
	0,4	20	<3	26	<3	**4,0**	20	<3	15	<3
14.12.2000	**0,0**	380	20000	380	20000	**0,0**	380	20000	380	20000
	0,05	370	17 100	378	17800	**0,5**	290	9100	270	4500
	0.1	365	9380	372	11000	**1,0**	120	260	93	110
	0,15	360	1 100	340	1700	**1.5**	90	140	56	50
	0,2	250	340	280	600	**2,0**	80	25	40	3
	0,25	198	218	210	250	**2,5**	70	12	29	<3
	0.3	170	88	200	210	**3.0**	30	<3	23	<3
	0,35	142	56	180	175	**3,5**	20	<3	20	<3
	0.4	80	32	140	60	**4,0**	15	<3	15	<3
	0,45	50	6	79	12	**4,5**	10	<3	12	<3
	0,5	35	<3	50	<3	**5,0**	10	<3	10	<3
	0,6	20	<3	37	<3	**6.0**	8	<3	10	<3
25.12.2000	**0,0**	396	22500	396	22500	**0,0**	396	22500	396	22500
	0,05	377	17230	391	17950	**0,5**	350	9300	320	4060
	0,1	369	9400	379	11200	**1,0**	298	900	280	570
	0,15	363	1260	370	1900	**1,5**	270	670	248	390
	0,2	256	360	295	650	**2,0**	225	230	200	26
	0,25	204	222	236	258	**2,5**	210	70	36	<3
	0,3	175	94	218	226	**3,0**	160	20	23	<3
	0,35	146	60	193	188	**3,5**	133	5	20	<3
	0,4	85	35	159	65	**4,0**	59	<3	15	<3
	0,45	52	8	85	17	**4,5**	38	<3	13	<3
	0,5	36	<3	57	10	**5,0**			10	<3
	0,6	21	<3	36	<3	**6,0**			10	<3



Picture 1: "Doze – effect" curve for "Dezavid" means
(river water, November 2000, average values)



Picture 2: "Doze – effect" curve for "Dezavid" means
(river water, December 2000, average values)

DEZAVID DECONTAMINATION EFFICIENCY TESTED ON SEWAGE WATER AT THE BRYANSK CITY AERATION STATION, December 12-13, 2002

GCB – General Coliform Bacteria
SRC – Sulphite-reducing Clostridia
TCB – Termotolerant Coliform Bacteria
PFU – Plate-forming Units
CFU – Colony-forming Units

Dose, mg/ l	Duration of treatment, min	GCB CFU/100 ml	TCB CFU/100 ml	Bactericidal efficiency, %
12.12.2002				
1. SW		1.400.000	1.100.00	
2. SW + DD 0,65 mg/l = p-p A_1 TDD = 0,65 mg/l	60	11.818	10.909	99,1
3. A_1 + DD 0,65 mg/l = p-p A_2 TDD = 1,3 mg/l	60	4.363	3.454	99,7
4. A_2 + DD 0,65 mg/l = p-p A_3 TDD = 1,95 mg/l	60	1.981	1.530	99,8
5. SW + DD 2 mg/l = p-p B_1 TDD = 2 mg/l	60	9.090	-	99,3
6. B_1 + DD mg/l 2 = p-p B_2 TDD = 6 mg/l	60	1.400	-	99,0
7. B_2 + DD 2 mg/l = p-p B_3 TDD = 6 mg/l	60	-	-	99,1
8. SW + DD 2,5 mg/l = p-p C_1 TDD = 2,5 mg/l	60	2.702	1.801	99,8
9. C_1 + DD 2,5 mg/l = p-p C_2 TDD = 5 mg/l	60	1.170	180	99,92
10. C_2 + DD 2,5 mg/l = p-p C_3 TDD = 7,5 mg/l	60	360	180	99,9
13.12.2002				
11. SW		1.100.000		
12. A_3 + SW (100 ml)	60	720.072	-	35
13. B_3 + SW (100 ml)	60	3.150	450	99,7
14. C_3 + SW (100 ml)	60	810	-	99,92

S – Sewage Water (320 ml Sample)
DD – Dezavid Dose
TDD – Total Dezavid Dose
p-p A1 A2 A3 D1 D2 D3 C1 C2 C3 - Solution

DEZAVID DECONTAMINATION EFFICIENCY TESTED ON RIVER WATER (DESNA RIVER, BRYANSK CITY)

Date	Sample	Dezavid Dosa, mg/l	Duration of treatment, min	GCB CFU/100 ml	Colifags PFU/100 ml	SKC CFU/20 ml	Bactericidal efficiency, %
17.12.02	River water			300			
	Test №1	0,5 + 0,5 + 0,5	9^{00}-10^{00} 10^{00}-11^{00} 11^{00}-12^{00}	70 not found not found			77 100 100
	Test №2	1,0 + 1,0 + 1,0	9^{00}-10^{00} 10^{00}-11^{00} 11^{00}-12^{00}	18,8 not found not found			94 100 100
19.12.02	River water			450			
	Test №1	0,5	3 hr 6 hr	not found not found			100 100 100
	Test №2	1,0	3 hr 6 hr	not found not found			100 100 100
23.12.02	River water			1000	> 16,1	found	
	Test №1	1,5	3 hr 6 hr	not found not found	16,1	4 CFU	100 100
	Test №2	2,0	3 hr 6 hr	not found not found	16,1	not found	100 100

Signed: L.A.Glushenkova

Head of Laboratory

2. Dezavid™ has proved its high efficiency in **sewage, storm collector water and pool water** disinfection.

As it is known from experience and studies, sewage water after having been treated with sand filters and decontaminated with chlorine can be used only for limited range of technological purposes – in the cooling circuit. Contact with the working staff is not allowed. The time of treating the filtered water with coli-index under 1000 with chlorine should not be less than 30 min. At the same time, a **Dezavid™** dose of 8 mg/l used for 10 min. produced 98 – 100% bactericidal effect. In the course of treatment with **Dezavid™** compound water substance content was improved. Easily oxidizable organic compound content was lowered (by 90%), phenol and synthetic surfactants content was decreased by 40 – 55%, smell and color removal was observed. This means that the indices, which usually cannot be changed in the process of sand filter afterpurification of sewage water and in the course of chlorination, are eliminated, wich makes the re-circulated sewage water quality similar to that of the surface water body.

DEZAVID sewage water decontamination efficiency by duration of contact (8 mg/l dose)

Duration of treatment, min	Coli-index	Bactericidal efficiency, %
0	2 150000	—
5	817000	62,00%
10	44000	97,95%
15	23200	98,92%
30	9600	99,55%

Parameters of sewage water before and after DEZAVID treatment (8 mg/l dose, duration of treatment 30 min.)

Parameter		Sample №1	Sample №2	Sample №3
Smell, grades	Before After	>5, of sewage 2, of mud	>5, of sewage 2-3, of mud	>5, of sewage 3, of mud
Color, degrees	Before After	64 37	62 32	56 29
Phenoles, mg/l	Before After	0,0034 0,0021	0,0029 0,0015	0,0018 0,0008
Syntetic sufactants, mg/l	Before After	0,072 0,037	0,094 0,054	0,087 0,039

DEZAVID sewage and pool water decontamination efficiency by duration of treatment (8 mg/ l dose)

Duration of treatment, min	Coli-index	Bactericidal efficiency, %
0	1 227 000	—
5	22 700	98,15%
10	1 089	99,91%
15	742	99,94%
30	15	100,00%

DEZAVID sewage and recirculated pool water decontamination efficiency by duration of treatment (8 mg/l dose)

Duration of treatment, min	Coli-index	Bactericidal efficiency, %
0	1 118 000	—
5	25 300	97,74%
10	1 126	99,90%
15	817	99,93%
30	12	100,00%

DEZAVID storm collector water decontamination efficiency by duration of contact (8 mg/l dose)

Duration of treatment, min	Coli-index	Bactericidal efficiency, %	HPC	Bactericidal efficiency, %
O	62 100	—	3960	—
5	19500	68,60%	1 800	54,55%
10	2300	96,30%	640	83,84%
15	320	99,48%	230	94,19%
30	30	99,95%	80	97,98%
0	67000	—	4300	—
5	21 100	68,51%	2500	41,86%
10	2670	96,01%	865	79,88%
15	375	99,44%	290	93,26%
30	39	99,94%	92	97,86%
0	88000	—	6250	—
5	28400	67,73%	3640	41,76%
10	3970	95,49%	2200	64,80%
15	558	99,37%	410	93,44%
30	87	99,90%	150	97,60%
0	72600	—	6200	—
5	25600	64,74%	3250	47,58%
10	3300	95,45%	1 080	82,58%
15	490	99,33%	370	94,03%
30	82	99,89%	130	97,90%

HPC – Heterotrophic bacteria Plate Count

As a result of test operation "Dezavid™" compound utilization advantages were ascertained as compared to the above-mentioned decontamination methods in effectiveness, disinfection, degree of positive effect on water technological, organoleptic and physical-chemical characteristics, also on the compound safety in production, transportation, storage and application at purification plants (disposal works). "Dezavid™" compound price is by 5 - 6 times lower than the price of chlorine and chlorinated agents.