ADEQUATE TECHNOLOGIES
INNOVATION COMPANY

User's Manual

"DEZAVID-POOL"

to provide for high quality water in swimming pools

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Pure Water In Your Pool

Dear pool owner,

Every day the water in your swimming pool absorbs from the environment various types of dirt, both of organic and non-organic origin: with rains and winds if the pool is in the open and through windows, doors and ventilation if your pool is an indoor pool.

Millions of microorganisms, as well as organic substances, like small parts of epidermis, cosmetics, creams and lotions, hair, etc., that form good conditions for bacteria multiplication are brought into the water by pool users.

Water and air temperatures, solar radiation, precipitation, artificial streams, fountains or waterfalls in the pool, frequency of the pool exploitation and regularity of the pool maintenance measures are the factors that affect the quality of water.

What is required to ensure flawless quality of water in a pool? The answer is regular care of the pool basin and effective water preparation.

1. Preparation of water

The basic components of effective water preparation are:

- filtration and circulation of water in the pool (physical water preparation);
- treatment of water with special preparations (chemical water preparation).

Both chemical and physical procedures of water preparation are equally important to provide for high quality of water in the pool and supplement each other.

Filtration and circulation of water alone are not sufficient to prevent the growth of microorganisms. Viruses, fungi and bacteria perish only when the water is **disinfected**, algae are suppressed by ***algaecide,*** whereas ***coagulants/flocculants*** help to eliminate turbidity and drain small particles that form the environment for the growth and evolution of microorganisms.

Hence, one cannot abandon the use of chemicals while taking care of a pool.

1.1. Physical preparation

For a private pool the following output characteristics of a percolator are recommended:

Minimum duration of one water cycle (t_1) dependant on the pool size (V) and its load is:

Pool load	Pool size		
	below 30 м^3	30 - 50 м^3	exceeding 50 м^3
small	t_1 = 5 h	t_1 = 6 h	t_1 = 7 h
medium	t_1 = 4 h	t_1 = 5 h	t_1 = 6 h
heavy	t_1 = 3 h	t_1 = 4 h	t_1 = 5 h

Small load – a family of less than 4 members, few visitors, not many plants and sources of dust near the pool.

Medium load – a family of 4 – 5 members, 1 -3 additional visitors, environmental influence is variable throughout the swimming season.

Heavy load – over 6 members in the family, more visitors, higher environmental influence.

The minimal productivity of the percolator (Q min) is calculated according to the following formula:

Q min = V/t_1, ($м^3$ per hour), with

V being the pool size in $м^3$;

t_1 – duration of one water cycle in hours

The total amount of water in the pool needs to pass through the percolator at least 3 times in 24 hours. This permits to eliminate most of dirt from water.

The minimum required time of filtration (t) is calculated according to the following formula:

t = **3V/Q,** (h), with

V being the pool size in $м^3$;

Q being the real productivity of the percolator in $м^3$ per hour.

Good circulation of water in a pool, functioning of a fountain, waterfalls or artificial water streams facilitate thorough mixing of chemicals with water throughout the whole pool and hinder the appearance of dead zones, i.e. places where the water stands too long and interacts with chemicals badly. And these are the places of rapid growth and evolution of microorganisms or algae.

During exploitation plenty of reagents are added to the pool water, which constantly raises mineralization of water and may promote destruction of materials of the pool basin, and reduce efficiency of disinfecting of water as well. To reduce the amount of salts a regular addition of fresh water is required (for private pools approximately 3 % of the pool volume a week). When a sand filter is used it is necessary to conduct its reverse washing at least once a week. Then (upon a signal of automatic water level controls) the pool is filled with fresh water. When automatic devices are not available the crane of fresh water is to be opened manually.

Leaves and other large rubbish should be extracted from the pool with a pool net. Algae, limy sediments, and other pollution on the bottom and walls of the pool are to be deleted with special brushes. Besides, it is necessary to take care of the pool bottom and walls with a vacuum bottom cleaner on a regular basis.

Also it is required to delete periodically dirt from mesh filters of the skimmer and the pump, and, if an overflow system is used, to wash overflow gutters and tanks once a month with the help of cleansers that are specified in section 8 of this Manual.

1.2. Chemical preparation

This includes four obligatory tasks:

A. Control of the pH index.
B. Elimination of metals from the pool water, (if necessary)
C. Disinfecting of water (decontamination),
D. Prevention of biofouling.
E. Liquidation of turbidity (coagulation).

Detailed information on application of various reagents is as following.

At storage and work with chemical preparations observance of safety precautions is a must! Read carefully section 6 of this Manual "Rules of dealing with chemicals"!

A. Control of the pH index

A 1. General

The hydrogen parameter pH is the index of the ***degree*** *of alkalinity or acidity of water.* ***When pH equals to 7 the water has neutral reaction, the water with pH over 7 is alkaline, and when pH is less than 7 acid.***

For a swimming pool water the pH index in a range of 7. 2 – 7.4 is considered optimal (7.0-7.6 is acceptable).

When the pH index is higher the water deposits lime, gets an unpleasant smell and may irritate eyes and skin of swimmers. If the pH index is low, metal parts of the pool are exposed to corrosion, while materials and welds of plate coverings may be destroyed.

After filling the pool with water, first of all, it is necessary to measure and adjust the pH index.

A 2. To reduce the pH index

pH-MINUS

Hydrosulfate of sodium.

To be applied according with the instruction.

A. 3. To increase the pH index

pH-PLUS

Bisulfate of sodium.

To be applied according with the instruction.

B. Elimination of metals from water, reduction of hardness

On the other hand the quality of water in a pool is dependant on the level of salts of calcium and magnesium (hardness of water).

With an increase of the pH index of the pool water that contains a large quantity of carbonates of calcium and magnesium (high carbonate hardness), the water first gets turbid and acquires milky-white coloring, then the carbonate of calcium settles on the pool walls and bottom. Sediment of calcium carbonate can be observed in the elements of the filter, which leads to a poor-quality filtration of water. Therefore the control of the pH index of water with high carbonate hardness should be particularly thorough (measurement and regulation of the pH index should be carried out at least twice a week).

When the pH index gets considerably low (usually it occurs in soft water) lime does not deposit, however aggressiveness of water grows due to high concentration of free coal acid. In this case metal elements of the pool may rust while materials and welds of plate coverings of the pool may be destroyed.

Reduction of hardness is performed with the help of:

B 1. Special means designed for elimination of ions of iron, copper, silver, calcium and other metals from water, as well as for removal of scurf of these metals at the pool bottom and walls ***(according to user's instructions).*** Such means reduce the overall hardness of water. Calcium and other metals that form insoluble compounds are precipitated in the filter and then removed from it by reverse washing.

B 2. Preparations used to increase the pH index:

- *Increase the pH index up to 9.5-10. Switch on the circulation pump, position "Circulation" of the 6-step valve.*
- *Switch off the pump when the pool water gets turbid.*
- *Wait for 12-24 hours for calcium carbonate to precipitate on the bottom, throughout that time the water must not be mixed of shaken.*
- *Remove the deposit with a manual bottom cleaner into the sewerage system.*
- *Reduce the pH index to 7.2-7.4.*

It should be kept in mind that even a small amount of the means to adjust the pH index applied in water with low carbonate hardness might cause a considerable change of the hydrogen index. Therefore in order to improve the quality of such water any means for the pH index control ought to be applied with extreme care (a step-by-step adjustment with measurements of the pH index taken after each dose of reagent is recommended).

During first 2-3 weeks after the pool launch the pH index should be measured every day so that it could be adjusted <u>without delay</u> if required (i.e. if pH is less than 7.0 or pH exceeds 7.6). It is desirable to record the results of measurements as well as to note the days when the preparation that reduces/increases the pH index was added. This way you can calculate the periodicity of required measurements and adjustments of the pH index in future. Usually, the periodicity equals to 1-2 times a week.

It is particularly important to perform daily measurements and timely adjustment of the pH index during the first month after coating the pool with slabs as the mortar may contain lime and would increase alkalinity of water and the pH index respectively. To prevent lime sediments or turbidity of water due to calcium carbonate precipitation it is necessary to keep the constant level of pH at 7.2-7.4.

C.D.E. Disinfecting water with «DEZAVID-POOL»

The pool water must be not only clear but hygienically perfect as well. Regretfully, even an indoor pool is doomed to absorb from the environment and visitors various types of pollution including pathogenic microorganisms. Because of that the pool water needs disinfection.

"DEZAVID-POOL" is a highly efficient and effective means of **triple action:**

- it eliminates bacteria, viruses and fungi,
- it prevents biofouling,

- it improves organoleptic characteristics of water.

«DEZAVID-POOL» differs from traditional chlorinated preparations and active oxygen based reagents as it:

- does not contain toxic components (chlorine, active oxygen, ozone, phenols or aldehyde);
- has no smell;
- its pH is 6±1
- does not produce carcinogens or volatile irritants;
- is effective against any pollution and with any quality of water;
- has sustained action;
- does not lead to adaptation of microorganisms;
- has a strong flocculent effect;
- is safe for humans and the environment;
- is harmless to any materials;
- does not require special conditions of storage and transportation;
- does not need some complicated equipment support;
- keeps its characteristics when defrosted;
- permits to cut costs of disinfection, prevention of biofouling, and improvement of organoleptic characteristics of water by up to 60%.

1. Application of «DEZAVID-POOL»

- Disinfect the pool basin.
- Fill the pool with water.
- Turn on the water purification system for 24 hours to remove potential physical pollution from water.
- Measure the pH index of water. If required adjust it to 7.2-7.6 (See p.p. A.2 and A.3)
- Stabilize hardness of water, eliminate metals (when appropriate).
- Add the preparation to water directly or via the batcher of the water purification system. The initial dose of the preparations is calculated as 8 grams per 1 cubic meter.
- Switch on the water circulation system for 24 hours as regards pools of less than 100 cubic meters, or for 48 hours as regards pools of over 100 cubic meters to mix the preparation with water.
- The maintenance dose of the preparation is at least 4 grams per 1 cubic meter. The preparation remains in water throughout 7-14 days.
- The periodicity of adding the preparation to the pool water should be measured according to the results of semi-quantitative analysis by means of the *«Test kit to measure «DEZAVID-POOL» in swimming pools».*
- The amount of the preparation in the pool water should be controlled once a week. When necessary the missing amount should be added.

ATTENTION!!!

When pools that previously were disinfected with preparations containing chlorine are to be transferred to the use of "DEZAVID-POOL" <u>the following measures must be taken</u>:

- Totally eliminate free chlorine (neutralize chemically) (See p.2)

- Replace partially the pool water (by 30-50%)
- Stabilize the pH index within the limit of 7.2-7.6
- Stabilize the water hardness at about 7 mg eqv/l
- Clean the pool basin of biofouling (if applicable)
- Do not apply the preparation along with oxidizing reagents (ozone, oxygen containing reagents, active oxygen).

Therefore, we recommend that:
1. the water in freshly filled swimming pools should be processed with the "DEZAVID-METAL MINUS" preparation before adding "DEZAVID-POOL".
2. the water in pools with non-exchangeable water should be cleared with the "DEZAVID-METAL MINUS" preparation if its characteristics exceed the above parameters.

2. Water dechlorination

To be used for water dechlorination is:
Sodium thiosulfate

To be applied and dosed *in accordance with the instruction.*

3. Cleaning of the pool basin

The primary condition to provide for hygienically clean water is cleanness of the pool itself. About once a year (or less if the maintenance is thorough) the pool water ought to be poured out, the pool bottom and walls cleaned earnestly with special chemical agents.

It is easier to clean the pool basin immediately after the water has been poured out when its walls are still wet and the cleaning agent does not soak into welds. Organic substances like oil and small algae are removed by means of neutral or alkaline agents. To eliminate lime sediments acidic preparations are used. ***Acidic and alkaline preparations may not be applied concurrently!***

To avoid additional pollution one should strive to cut down the amount of cleaning agents that hit the pool water. To this end, the surface needs thorough washing after cleaning to eliminate residual chemicals, and then the remaining rinsing water ought to be removed.

Built-in stainless steel parts should not be treated with acidic cleaning agents, because the colour of metals may change. Treatment of such parts is to be performed with ordinary household chemicals used for cleaning of stainless steel goods.

Do not use metallic sponges. Apply a viscose sponge or a plastic brush with rough bristle.

In order to prevent biofouling, on completion of disinfecting and cleaning, the pool bottom and walls need to be treated with a 1% grout of "DEZAVID-P" disinfectant and be left to get dry. Then fill the pool with fresh water.

As «DEZAVID-POOL» has strong flocculant power spots may appear on the pool bottom. Such spots are a result of the preparation tearing of rust and chlorine corrosion products off metallic elements of

the pool water supply system or other metallic parts vulnerable to corrosion, like non-covered with chrome foot bearings of bar tables and counters. Such spots are easily removed with a pool «vacuum cleaner».

When keeping in store or working with cleaning agents always observe safety precautions specidied in section «Rules of dealing with chemicals» of this manual. *For example, when cleaning the pool you* ***ought to*** *put on protective clothes, rubber gloves, a rubber apron and protective glasses!*

4. Preservation of the pool for winter

Our experience shows that **an outdoor pool should not be left empty in winter,** regardless of the materials it is built of. The main danger is that the volume of soil around it may change when frosen. Frosen and thawing ground waters close to the pool drastically increase the pressure on the walls, which may lead to a destruction of concrete and metallic parts of the basin. The water inside the pool presents natural counter-pressure that is required to withstand the pressure of ground waters. At the same time the pool water is a natural heat insulator that protects the pool walls of sharp temperature drops.

It is essential to preserve the pool before first frosts. Follow «The instruction for preservation of the pool for winter».

«DEZAVID-POOL» is an ideal means to prevent active growth of algae, bacteria and fungi if expected frosts are delayed. At the same time it retains its characteristics after the pool gets defrosted.

5. General recommendations for pool maintenance

The below measures are to be taken regularly (at least once a week):

- Extract leaves and other big size dirt from the pool with a pool net.
- Remove lime deposits and other sediments from the pool bottom and walls with a special brush.
- Remove dirt from mesh filters of the skimmer and the pump.
- Clean the pool bottom and walls with a bottom vacuum cleaner.
- Perform reverse washing of the sand filter.
- Test the water with special instruments or detectors
- Based on the results of the tests and prescriptions for preparations add all necessary reagents.

It is recommended to check the amount of «DEZAVID-POOL» in the pool water once a week.

6. Rules of dealing with chemicals

Preparations need to be kept in tightly closed original packing placed in absolutely dry, well-aired and childproof room.

Different chemicals may not be stored in close vicinity to each other.

Different chemicals may never be mixed.

When working with chemicals, in particular with concentrated grouts for pool cleaning it is required to put on protective clothes, rubber gloves, a rubber apron and protective glasses.

Avoid contacts of preparations with skin and clothes. If a reagent hits your skin it needs to be washed off with a big amount of water and if necessary a doctor should be called.

If reagents hit your eyes they need to be cleansed with a big amount of water and a doctor should be called. Avoid inhaling fumes (preparations cause irritation of respiratory organs), if this happens immediately go to the open.

If by accident you swallow a chemical call a doctor immediately.

Avoid leekages of concentrated solutions into soil, ponds and lakes.

Scattered solid preparations need to be thoroughly collected with a dry brush.

If a liquid preparation has been spilled let it be absorbed by sand or other friable material and then collect it with a brush; small quantities of a preparation should be diluted with water and washed off.

Use only special tanks for preliminary solution of preparations.

Never pour water to a concentrated chemical, always add a chemical to water.

7. If problems arise

Problem	***Possible cause***	***Solution***
Water is clear with greenish tint. Brown spots on the pool bottom and walls.	Water contains iron (yelowish-green colour of water) or copper (turquoise colour).	Adjust the pH index; remove from the pool water ions of iron, copper, silver, calcium and other metals. Brown spots can be eliminated with a special pool bottom cleaner (first empty the pool).
Water is turbid of brown colour.	Water contains iron.	
Water is turbid of black colour.	Water contains manganese.	
Water is turbid of milky colour.	Water contains dredges, colloid particles (pollution) of organic origin.	Adjust the pH index; add a coagulant for high turbidity according to the manual.
	Water contains insoluble salts of hardness or a coagulant non-deferred by the	Adjust the pH index; reduce hardness of water.
Slimy sediments on the pool walls. Water is turbid of green colour.	Algae growth.	Adjust the pH index; check the amount of «DEZAVID-POOL» in the pool water, make it reach the level of 8 mg per 1 liter.
The pool walls have become rugged.	Sediments of salts of hardness, i.e. calcium and magnesium (lime deposits).	Empty the pool; remove sediments. The pH index must be kept within 7.2 – 7.4 range.
		Treat the pool walls with a cleaner according to its user's manual.
Heavy foaming of water in pools with an artificial stream.	Water contains remains of a winter preservative or a cleanser.	Increase the amount of added fresh water. Do not use household cleansers.

Corrosion of metal elements of the pool	The pH index is too low.	Increase the pH index to 7.2 – 7.4.

8. How to prepare the pool for «season»

If the pool is treated properly, i.e. an optimum filtration mode is provided, timely cleaning, adding of chemicals and reverse washing of the filter are performed, then it is not necessary to change the pool water every year.

If the pool is heavily polluted after winter it is necessary to empty it and clean thoroughly.

*When cleaning the pool you **ought to** put on protective clothes, rubber gloves, a rubber apron and protective glasses!*

- **Cleaning of the skimmer and protective coating of the pool.** Before you empty and clean the pool it is required to clean the skimmer and protective coating of the pool, as they may be breading grounds for microbes. The skimmer can be cleaned mechanically.
- **How to empty the pool.** Remove dirt from the walls and deposits from the bottom with a brush and a manual bottom cleaner, then empty the pool.
- **How to clean the pool properly.** Apply an acid preparation to eliminate lime deposits or an alkaline to remove dark spots of organic origin, leave it to take effect, them wash off. ***Do not apply acid and alkaline preparations together! An acid preparation may be applied** only after **complete removal** of an alkaline off the surface and vice versa! Do not use for cleaning of the pool household chemicals that contain ammonia or phosphates!*
- **How to protect the pool basin against algae.** Treat the pool walls and bottom with a 1% solution of «DEZAVID-S» and let it dry out before filling the pool with water. This way you can prevent the appearance of algae colonies or deactivate their spores.
- **How to check the condition of the water circulation equipment.** Check the condition of the filtration plant, amount and quality of the filtration material (sand) after winter preservation and fill up the filter with sand (See «The instruction for preservation of the pool for winter»). Replace the sand if required. (When the pool water and filtration system are treated well the sand needs to be changed once in 2-3 years if the pool is in continuous use and once in 3-5 years if the pool is used in season only).
- **Check the availability and condition of chemicals.** Check the availability and expiry dates of chemicals, buy the missing ones and, primarily the means of adjusting the pH index, that in the first period will be required in bigger amounts than usually. A necessary amount of «DEZAVID-POOL» must also be available.
- **Check the availability and condition of water testing preparations.** Check the availability and expiry dates of detectors. If their colour has changed new preparations ought to be acquired!
- **How to fill the pool with water.** The water that is poured into and added to a private swimming pool must meet the hygienic requirements for drinking water. The water that enters the pool from municipal water supply systems normally is clear, colourless, has good taste and does not contain harmful chemical compounds or microorganisms. When the pool is to be filled with water off an autonomous well or ground spring it needs to be tested to check whether it is suitable for the pool. **If**

the original water contains too much salts of hardness, iron or manganese a preliminary water preparation is recommended.

- **Initial treatment of water with chemicals.** When dosing, *instructions for application of appropriate preparations for filling the pool* need to be followed. After the pool is filled with water, using pH-plus or pH-minus make the pH index reach 7.2 - 7.4, add the initial dose of «DEZAVID-POOL». Then switch on the filtrarion plant in continuous filtration mode and leave it for 2-3 days. Now the pool may be used and further on it needs ordinary treatment. In the initial period do not forget to control the pH index and the residual amount of «DEZAVID-POOL» daily.

Have a nice swim!