21- DAISY "DRYDEN AQUA INTEGRATED SYSTEM"

Biological instead of chemical approach

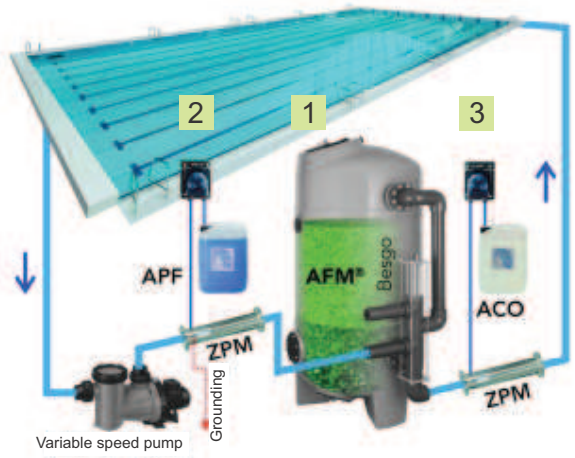
Traditional water treatment tries to avoid disease transmission by using more and more chlorine, UVC irradiation or ozone. But the transmission of pathogens is a biological problem; it therefore needs a biological solution. The approach of the Dryden Aqua integrated water treatment system does exactly that: Instead of using more powerful disinfections and expensive equipment, we design a pool water treatment process that changes the water to make it difficult for viri, bacterium and parasites to live and to reproduce:

Prevent instead of killing!

1. **No substrate:** As a consequence of our bio-resistant AFM® , bacterium have no substrate on which they can grow and multiply.

2. **No nutrients:** We remove food for bacteria by advanced coagulation, flocculation and filtration. Bacterium cannot grow anymore.

3. **The lower the chlorine demand, the lower the disinfection by-products (DBP's):**
   DAISY filters almost everything out of the water and reduces the chlorine demand to the lowest level possible. The lower the chlorine oxidation demand, the lower the concentration of chlorine disinfection by-products in the water and in the air.



1 Filtration with **AFM®**
2 Coagulation and flocculation with **APF** and **ZPM**
3 Catalytic oxidation with **ACO** and

DAISY consists of three integrated steps:

1. Filtration with the bio-resistant filter media **AFM®**
2. Best coagulation and flocculation with **APF** and **ZPM**
3. Enhanced oxidation with **ACO** and **ZPM**

Step 1: Filtration with AFM®

AFM® stands for Activated Filter Media, a revolutionary filter media made from green container glass, developed by marine biologist Dr. Howard Dryden. AFM® exceeds the performance of quartz and glass sand by filtering 30 % - 50 % more organics and sub 5 micron particles out of the water. The catalytic properties on the surface of AFM® make it self-sterilizing and bio-resistant, which means no biofilm is formed in the filter bed. This reduces the chlorine demand and therefore the formation of harmful volatile disinfection by products such as THM's, cyanogen chloride and trichloramine. Not only the chlorine smell but also the risk of getting infected by pathogens like Legionella or cryptosporidium, is greatly reduced. The pool is healthier for people, especially children, safer for the environment and economical with crystal clear water. AFM® has been successfully used in over 100'000 public and private swimming pools worldwide.

Step 2: Best coagulation and flocculation with APF and ZPM

AFM® Grade 1 will remove particles down to 4 microns at a filtration speed of 20 m/h. When AFM® is combined with a ZPM static mixer using APF (All Poly Floc), the nominal filtration will go down to 0,1 microns and much of the dissolved organic matter will also be removed. Dissolved organics such as urea, creatine and amino acids are responsible for 80 % of the chlorine demand.
Lower concentrations of organic matter mean lower chlorine demand and lower concentration of disinfection by-products (DBP's)

Step 3: Enhanced oxidation with ACO and ZPM

Bacteria colonies protected by biofilm are very resistant to chlorine. The ZPM is a safety barrier against these bacteria flocs. By cavitation in the ZPM, nano-bubbles are formed which will smash the flocs into individual bacteria, which can now be easily oxidised by chlorine.
ACO acts as an oxidation catalyst and chlorine stabilizer in outdoor pools. With ACO, the natural disinfection power of the sun is significantly increased and chlorine is protected from photo oxidation.

Pool Filtration

NSFN/SAFN/ASNI 5S0I 6&1 61

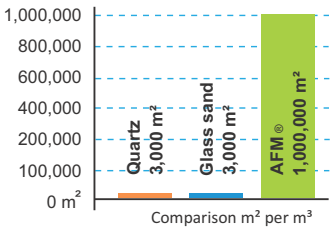
AFM® – ACTIVATED FILTER MEDIA 10

AFM® is a unique bio resistant filter media
The raw material used for AFM® is green container glass. The glass is washed, disinfected, thermally treated then reduced to a very specific grain size and shape. For security reasons, the production process (cyclonic size reduction) assures that no dangerous glass splinters are present in the filter media. After size reduction, the grains are activated in a patented three step process. This creates a mesoporous structure with a huge catalytic surface area of 1 million m2 per m3. The surface area is 300 times larger than the surface area of sand or other glass filter media. The surface area is important for all adsorptive and catalytic reactions. In contact with the water free radicals (OH-radicals) are formed, which protect the surface from bio-fouling. The larger the surface area the higher performance and bio-resistance you will get from the media.
To produce one ton of AFM®, 1,8 tons of green glass is needed. AFM is produced according to ISO 9001-2008 standards. We now also have the worlds most important certification for drinking water: NSF 61.

Advantages:

- Crystal clear water
  AFM® filters at least 30 - 50% more than quartz or glass sand.
- Lower consumption of chlorine
  The better the filtration, the lower the chlorine demand.
- No trichloramine - no chlorine smell
  AFM® prevents growth of biofilm.
- No biofilm – no Legionella
  Biofilm is a home for pathogens such as Legionella.
- Perfection for chlorine-free systems
  AFM® greatly reduces the oxidation demand.

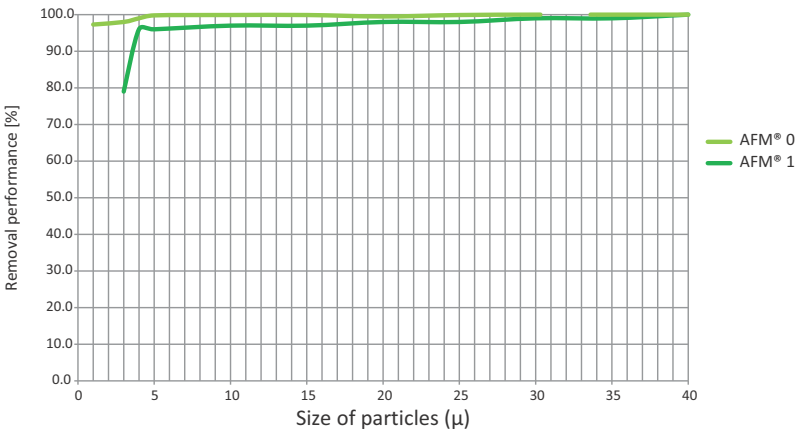
Comparison quartz, glass sand and AFM®



AFM® has a approximately 300 times greater surface as quartz or glass sand.

AFM® – ACTIVATED FILTER MEDIA

Particle size removal performance



The graph above shows the latest test results (July 2014) from IFTS (Institut de la Filtration et des Téchniques Séparatives, www.ifts-sls.com).
Different glass filter media and sand were tested. The experiment was done without flocculation and at a filtration rate of 20 m/h to get a representative comparison.
AFM® 1 will remove more than 95 % of all particles in the water down to 4 microns. The best a new, very high quality sand or other glass filter media can achieve is 20 microns at an efficiency of 95 %. In addition the filtration performance with AFM® will stay at this high level for many years.
AFM® 0 has been developed for best filtration where flocculation cannot be used. AFM® 0 is able to remove particles of 1 micron at an efficiency of more than 95 %. AFM® 0 cannot be combined with flocculation. The backwash speed should be about 30 m/h.

Filter filling:
Dryden Aqua recommends the following layers:

without AFM® 0	**with AFM® 0**
70 % AFM® 1	20 % AFM® 0
15 % AFM® 2 as supporting layer	50 % AFM® 1
15 % AFM® 3 as supporting layer	30 % AFM® 2 and AFM® 3 as supporting layer

Remark:
For smaller filters (<1000 mm diameter) and for all filters with nozzle plate irrespective of filter diameter, use 70 % of AFM® 1 and 30 % of AFM® 2. AFM® 3 is for larger diameter filters to ensure adequate filtration.

CODE	DESCRIPTION	PACKING	WEIGHT kg	VOLUME m³
AFM-00	AFM® GRADE 0 0.25 - 0.5 mm	1	25	0.015
AFM-01	AFM® GRADE 1 0.5 - 1.0 mm	1	25	0.015
AFM-02	AFM® GRADE 2 1.0 - 2.0 mm	1	25	0.015
AFM-03	AFM® GRADE 3 2.0 - 4.0 mm	1	25	0.015

APF - ALL POLY FLOC 20
Highly efficient coagulant and flocculant
APF is a unique multi-spectrum coagulant and flocculant. Coagulation is the process of dragging dissolved chemicals out of solution. These are responsible for about 80 % of the chlorine demand. APF is composed of 0,5 l NoPhos which prevents effectively algae and bacteria growth. APF combined with AFM® and a ZPM will achieve the best possible filtration performance. The nominal filtration will go down to 0,1 microns.
• Crystal clear water: Nominal filtration to 0.1 microns
• Up to 80 % less consumption of disinfection agent
• Basis for chlorine free system
Dosage: *Application rate is 0.5 - 1.0 ml per m³ of water filtered per hour.*
For example, if water flow through filters is 10 m³/hr, APF dosing rate will be 5 - 10 ml/h. Inject APF into the pipework between the pumps and the filter.

CODE	DESCRIPTION	PACKING	WEIGHT kg	VOLUME m³
20011	APF private pools 20 kg	48 pcs/pallet	960	
20012	APF public pools 20 kg	48 pcs/pallet	960	

Pool Filtration

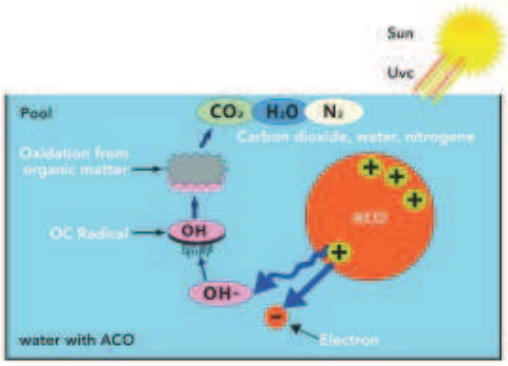
ACO - ACTIVE CATALYTIC OXIDATION 20

ACO is a highly innovative, ecofriendly product that disinfects water by amplifying the natural disinfection power of the sun. ACO also protects chlorine from sunlight and UV. ACO is especially effective in outdoor pools. ACO has 3 main features:

- Oxidation catalyst: ACO is a catalyst that amplifies the natural disinfection power of the sun. ACO can be combined with any conventional oxidizing agent (chlorine, bromine, peroxide). Sun in combination with ACO will make your water sparkling clear.
- Chlorine stabilizer: ACO protects chlorine and bromine from photo oxidation. The half-time of chlorine increases by a factor of 4 – 5 and the chlorine demand will be reduced by 30 %. By using ACO as a chlorine stabilizer the effectiveness of chlorine will not be decreased like with cyanuric acid. With ACO the opposite happens: oxidation improves because free radicals are formed in this process.
- Peroxide booster: ACO supports the disinfection power of hydrogen peroxide and thereby ensures crystal clear water.

Manual dosage: *1 l per 100 m3 of pool water per week (first time: 2 l) apply directly to pool (shake well before use).*

Automatic dosage: *0,5 – 1,0 ml per m3/h water circulated.*



CODE	DESCRIPTION	PACKING	WEIGHT kg	VOLUME m³
20022	ACO 5 kg	4 pcs/carton - 160 pcs/pallet	20/800	
20021	ACO 20 kg	36 pcs/pallet	720	

NOPHOS - NO PHOSPHATE 20

NoPhos => No Phosphate => No algae and bacteria

NoPhos extracts phosphate from the water. Phosphate is a vital nutrient for algae and bacteria. If all phosphates are removed from the water, algae and bacteria cannot survive and they will disappear after about 6 weeks.

Nophos is a biological solution and the best preventive treatment against algae, replacing the need for all other algicides. NoPhos is the best solution for public and private swimming pools, ponds, natural swimming pools, water features and fountains. Acting also as a coagulant, it will make the water much clearer as well.

- The biological solution against algae and bacteria
- The water becomes crystal clear

Dosage: *Weekly add 1 - 2 ml per m3 of water (ex.: 50 m3 pool = 100 ml).*

CODE	DESCRIPTION	PACKING	WEIGHT kg	VOLUME m³
20000	NoPhos 1 l / 1.2 kg	12 pcs/carton - 960 pcs/pallet	14.4/1152	
20001	NoPhos 5 l / 6 kg	24 pcs/carton - 160 pcs/pallet	960	
20002	NoPhos 20 l / 24.5 kg	48 pcs/pallet	1176	

PHOSPHATE TEST KIT 20

By using the Phosphate Test KIT you can measure the phosphate concentration in less than 1 minute and then dose NoPhos accordingly.
To bind 0,1 ppm phosphate, you need 1 ml NoPhos per m3 of pool water.
Example: At a pool volume of 100 m3 and a phosphate concentration of 0,5 ppm (= mg/l = g/ m3), you need 500 ml of NoPhos.
Target values for phosphate concentration:
Swimming pools/water features: 0,0 ppm
Natural swimming pools/ponds: 0,05 – 0,1 ppm

CODE	DESCRIPTION	PACKING	WEIGHT kg	VOLUME m³
20005	Phosphate Test Kit (20 tests)	20 pcs/carton - 720 pcs/pallet		

DRYOX 20

DryOx removes biofilm easily and economically
Each tablet of DryOx dissolved in water generates 2 g of chlorine dioxide. Chlorine dioxide is a soluble gas that penetrates the biofilm and removes it. Chlorine can't do that because chlorine must oxidize through the biofilm first. DryOx is about 100 times more effective in removing biofilm than chlorine.
• Highly reduced risk of legionella and other pathogens living in biofilms
• Less chlorine consumption; less chlorine smell
• Less combined chlorine
The higher the concentration and the longer the exposure time, the more effective will be DryOx.
Where to use DryOx?
In swimming pools
• Periodic application every 4 week:
Add – especially in warm water pools - 1 DryOx tablet per 10 m3 of water to the skimmer or to the balance tank every 4 weeks. Backwash after 30 minutes. The concentration of chlorine dioxide cannot exceed 0,2 mg/l.l
• Deep Clean every 3 month:
Add 2 DryOx tablets per 10 m3 of water and backwash after 30 minutes. The concentration of chlorine dioxide cannot exceed 0,4 mg/l.
• Disinfection of filter media:
Fill the balance tank. Add 2 DryOx tablet per 10 m3 of pool water in the balance tank. Dissolve the tablet and stop the pumps for 10 minutes. Turn the pump on for 5 minutes and then turn them off again for 1 hour. Let the high concentration of chlorine dioxide be effective. Backwash the filter after 1 hour. It's ideal to combine this cleaning process with a 3 - 5 ppm chlorine concentration to kill any remaining bacteria.
• Cleaning solution:
Add 1 tablet to 20 liters water and wash down the dirty surface (channel, cover) with this solution. Let it work for 1 hour and rinse with water.
In portable whirlpools and hot tubs:
• Add 2 tablets per 1000 l water volume turn on the filter and massage system and let DryOx work for an hour. Do not use the pool during this time. After one hour, completely drain the pool water, rinse and refill with fresh water. Your whirlpool is now free of biofilm. Repeat this treatment at least every 3 months.

CODE	DESCRIPTION	PACKING	WEIGHT kg	VOLUME m³
20031	DryOx for whirlpools 8 x 1 tablets	20 pcs/carton - 720 pcs/pallet		
20032	DryOx for swimming pools 8 x 1 tablets	20 pcs/carton - 720 pcs/pallet		
20033	DryOx for swimming pools 60 x 1 tablets	180 pcs/pallet		

ZPM - ZETA POTENTIAL MIXER 30

The static mixer for the cavitation of water

ZPM stands for Zeta Potential Mixer and is a static mixer manufactured in stainless steel 1.4571. The cavitation reactions help to disinfect the water for a lifetime.

Upstream of the filter – optimize coagulation and flocculation: The ZPM amplifies the coagulation and flocculation reactions for the conversion and precipitation of dissolved components into small particles.The cavitation reactions provide the perfect mixing and turbulent environment necessary for coagulation using APF and NoPhos. The ZPM neutralises the electrical charge (Zeta Potential) on dissolved chemicals and small particles to make some positively and some negatively charged. The opposite charges attract and this causes coagulation and flocculation. As the electrical potential drops to neutral, the redox oxidation potential of the water increases by up to 100 mV, effectively the water is beginning to disinfect itself without the use of any chemicals. Choose the size of the ZPM according to the pressure loss. Pressure loss should be between 1 and 2 mWS (0,1 – 0,2 bar).

Downstream of the filter - mechanical disinfaction: The cavitation produce nano-bubbles that disinfect the water. The higher the pressure loss, the better the disinfection performance. Some pathogens (e.g. Cryptosporidium) as well as biofilm rotected colonies of bacterium floc are extremely resistant to chlorine. The ZPM breaks these colonies or floc apart and allows chlorine to disinfect the water before it reaches the pool.
Choose the size of the ZPM according to the pressure loss. Pressure loss should be between 1 and 5 mWS (0,1 – 0,5 bar)

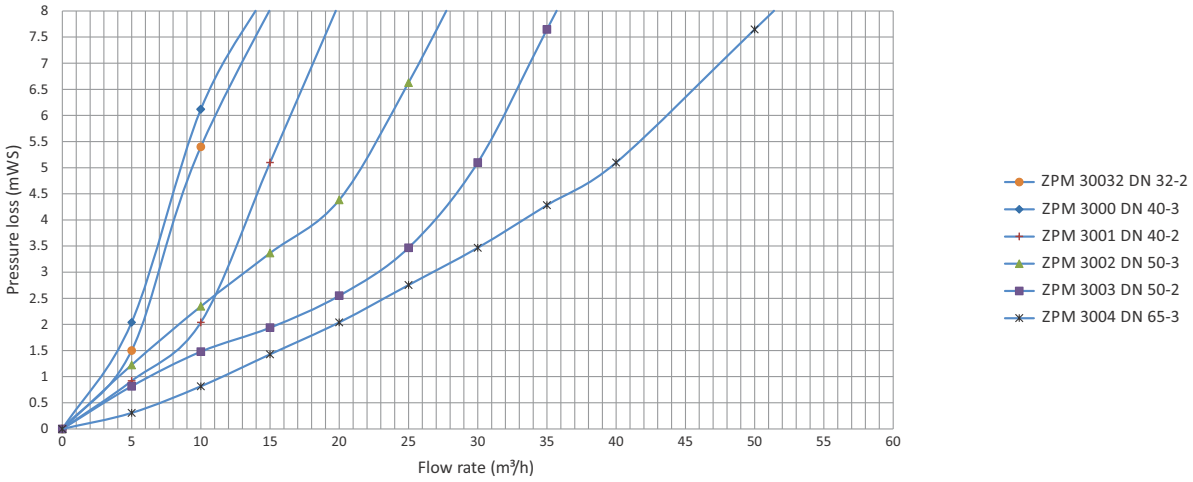
Imploding nano-bubbles disinfecting water.

CODE	SIZE	No. of FINNS	CONN.	LENGTH mm	PRESSURE LOSS (m³/h) 2 mWS 0.2 bar	3 mWS 0.3 bar	5 mWS 0.5 bar	PACKING	WEIGHT kg	VOLUME m³
30032	DN 32	2	1" ET	140	6	7	9.5	1	0.35	
30000	DN 40	3	1" ET	235	5	6.5	8.5	1	0.75	
30001	DN 40	2	1½" ET	195	10	12	15	1	0.75	
30002	DN 50	3	2" ET	300	8.5	13	21.5	1	1.2	
30003	DN 50	2	2" ET	240	15	23	30	1	1.2	
30004	DN 65	3	2½" ET	332	20	27	40	1	2.8	
30005	DN 80	3	3" FL	419.6	20	30	45	1	11.2	
30006	DN 100	3	4" FL	519.6	50	60	80	1	14.4	
30013	DN 125	3	5" FL	640	70	85	115	1	21	
30007	DN 150	3	6" FL	759.6	100	125	170	1	26.8	
30008	DN 200	3	8" FL	979.6	175	220	290	1	41.2	
30009	DN 250	3	10" FL	1219.6	260	325	420	1	58.6	
30010	DN 300	3	12" FL	1496	385	475	500	1	77.2	
50020	Injection valve DA ½“ with non return valve for ZPM									

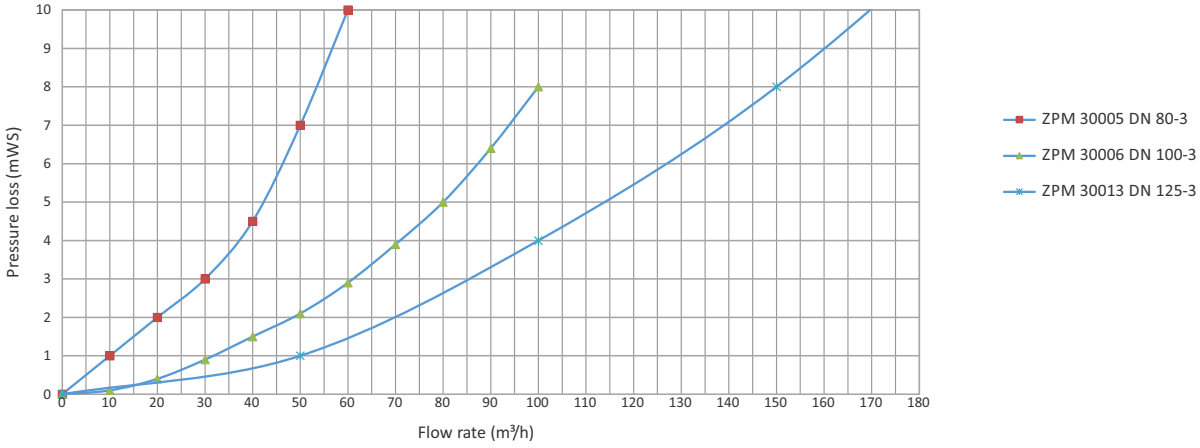
ET = external thread / FL = flange
1 bar ≈ 10 mWS

All ZPM's included 1 DA injection valve (item 50020)
DN32 – DN50: 1 injection point ½" / **DN65 – DN400:** 2 injection point ½"

Pressure loss DN 32 - DN 65



Pressure loss DN 80 - DN 125



Pressure loss DN 150 - DN 300