



**MANYETİK ARITMA  
SİSTEMLERİ**

**5 YEARS GUARANTEE**

**MADE IN TURKEY**

Ministry of Industry and Trade

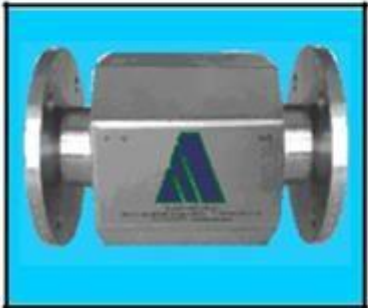
Turkish Patent Institution

Guarantee Cert. No: 66761

Utulity Model No: TR 2008 09

Ministry of Health UBB Serial Numbers: 869 923 433 0018 - 869 923 433 0025

## **AKUAKA MAGNETIC LIME SCALE PREVENTIG DEVICES**



**AKUAKA FOREIGN TRADE LIMITED COMPANY**  
**Manufactures Magnetic Lime Scale Preventing Devices**

**To Meet Every Demand**

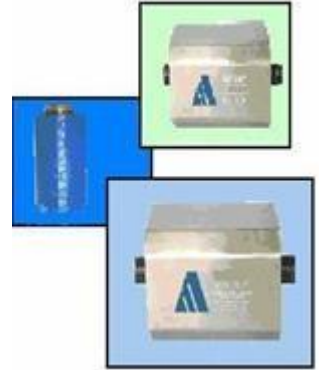
Various Nominal Diameters From 1/2" to 40"



**To Be Effective In Every Temperatures Which Will Be**

**Faced With**

At Four Temperature Intervals As 90°C,  
180°C, 250°C and 600°C



**To Obtain Long Lifetime**

Bodies and Couplings With AISI 304 Stainless Steel  
Which Has No Effect On Magnetic Field

**To Be Effective For Calcium Carbonate in Water Ranging From Lowest To Highest**

Using Neodymium Iron Boron (NdFeB) Magnets Which Have  
14.500 Gauss Magnetic Flux Density

**AKUAKA MAGNETIC LIME PREVENTING DEVICES**

Have Three Functions With The Affects Of Magnetic Field Exerted By Magnets



Prevent  
Lime Scale Formation!

+

Dissolve Present Scale!

+

Prevent Corrosion  
In Metallic Surfaces!

## Akuaka Magnetic Lime Scale Preventing Devices

Have A Guarantee Of



Approved With Ministry of Industry and Trade And Have A Economic Lifetime



### **AKUAKA Magnetic Lime Scale Preventing Devices**

Comply With Pressurized Equipment Devices Directive (97/23/EC) And Electromagnetic Compatibility Directive (89/336/EEC) Thus Have "CE

Mark" Türkiye'de İlk **CE Belgeli** Cihazlardır.

**WATER AND CALCIUM CARBONATE (LIME)**



While water, as rain, dropping from sky to the Earth encloses carbon dioxide and oxygen by contacting with them in atmosphere and enriches with carbon dioxide and oxygen gradually. In the land, rain waters drain into ground and dissolve calcium or magnesium carbonate, or sulphates (i.e.

lime salts) when contact with them by the aid of dissolved carbon dioxide.

According to types of lime salts, then calcium or magnesium bicarbonates or sulphates are formed in water. Mass of calcium or magnesium carbonates, or sulphates that will be dissolved in water varies with the quantity of dissolved carbon dioxide in water. The hardness, i.e. lime in water, of water varies according to type of lime salts and nature of soil which is contacted by water as well as quantity of lime dissolved.

Calcium or magnesium bicarbonates are not stable, they are turned into calcium or magnesium carbonate (as known "lime scale" in public) once more when carbon dioxide leaves from water by the effect of increasing temperature etc. The lime scales which are formed in pipes, installations and devices in which water is used based on conversion of calcium or magnesium bicarbonates to carbonates.

Lime (i.e. calcium or magnesium carbonate), normally is not dissolved in water.

Lime is dissolved in water when it contains carbon dioxide (CO<sub>2</sub>) only.



Lime persists as a dissolved form in water as well as it contains carbon dioxide ( $\text{CO}_2$ ).  
Lime scale is formed when carbon dioxide leaves from water with various reasons.



Temperature is the most effective reason leaving of carbon dioxide from water.  
Lime scale closes pipes, decreases effectiveness of devices and gives some damages.



### SYSTEMS FOR PREVENTING LIME SCALE FORMATION Chemical Water Treatment Systems

Chemical water treatment systems, which are consist of carbon filter, to hold particles and dirt, salt (i.e. sodium chloride), to regulate pH's of water, and ion exchange resin, to exchange calcium cations with sodium cations, convert calcium or magnesium bicarbonates into sodium carbonates.

Chemical water treatment systems necessitate to replenish carbon filters and resins when they are not efficacious and to use of salt regularly.

#### **Inhibitors**

Inhibitors act on calcium or magnesium carbonates in water like resins in the chemical water treatment systems and prevent formation of lime scales by converting calcium or magnesium bicarbonates into other chemicals which are soluble in water.



**Preventing lime scale formation by using inhibitors or by chemical water treatment systems need to be used of chemicals or salt regularly and to be replenished carbon filters and resins in the case of necessity. Due to this reason, inhibitors and chemical water treatment systems necessitate operating cost as well as capital allowances.**

## Magnetic Lime Scale Preventing Devices

Magnetic lime scale preventing devices consist of magnets which have higher magnetic flux densities. They prevent formation of lime scale in pipes and installations by changing crystal structure of lime in water and formation of corrosion, and dissolve present lime scales which are formed previously by changing surface tension of water also.



As it is known, water include mainly calcium bicarbonate despite magnesium bicarbonate is very little quantity. For this reason, lime scales in pipes and installations mainly consist of calcium carbonates.

Magnetic lime scale preventing devices convert calcite crystals, which are most common crystal of calcium carbonate, into aragonite crystal, which are another crystal structure of calcium carbonate, by the effect of magnetic field. As a result of changing crystal structure magnetic lime scale preventing devices provide to form softy particles of aragonite in water instead hard and adherent scales of calcite when they precipitate.

The effects of magnetic field exerted by permanent magnets in magnetic lime scale preventing devices are carried up to the end of pipes by moving water, in proportion to magnitude of magnetic fields and conductivity of water. Magnetic effects can also be carried up to 5 km according to magnitude of magnetic fields and conductivity of water.

### **Magnetic lime scale preventing devices**

**consist of given number of permanent magnets and operate exerting magnetic field.**

**The magnitude of magnetic field exerted by magnets depends on magnets types and numbers, and magnetic flux densities of magnets.**

**Magnetic lime scale preventing devices work effectively provided that the types and number of magnets are proportional to water flow rates and hardness of water.**

**In addition, electrical conductivity of water should be too enough to carry magnetic effects to the ends of pipes.**

**AKUAKA MAGNETIC LIME PREVENTING DEVICES can be used at installations and devices in which water is used from houses to business premises, from hotels to hospitals, from agriculture to industry**

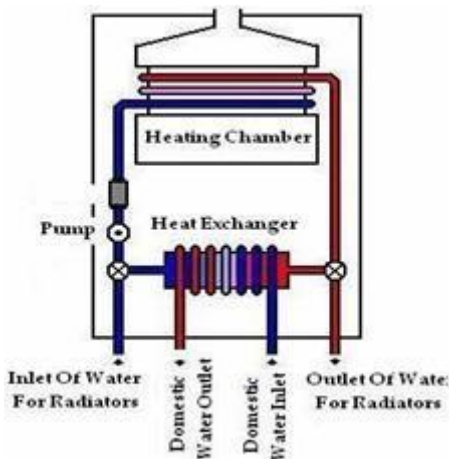
## Washing Machines And Dish Washers



Resistances and other parts which contact with water in washing machines and dish washers are faced to risk due to lime in water. **Akuaka Magnetic Lime Scale Preventing Devices** which will be installed water inlet pipes of washing machines and dish washers decrease consumption of electricity up to 30 % and quantity of detergents up to 50 % by preventing lime scale and corrosion formation and dissolving present scale.

## Combo Heaters

We want that our combo heaters work effectively in cold winter days and we are given maintenance of them periodically. But we don't think that tubes can not transfer the heat effectively into water and we will face to lose of energy due to surrounded tubes by lime scales. The lime in water will be decrease effectiveness of combo heaters and cause to lose energy by surrounding heat transfer surfaces when if it would be any measure.

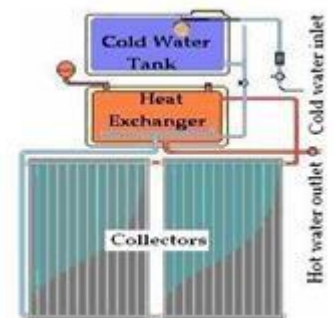


Combo heaters have two individual heating lines, one for domestic water heating and one for radiator water heating. Domestic water heating line is an open loop in which water enters combo heaters, is heated there and leaves from faucets and showers. Radiator heating line is a closed loop that water that heated in combo heater is circulated between combo heaters and radiators continuously.

**Akuaka Magnetic Lime Scale Preventing Devices for radiator heating line should be installed after circulation pump.**

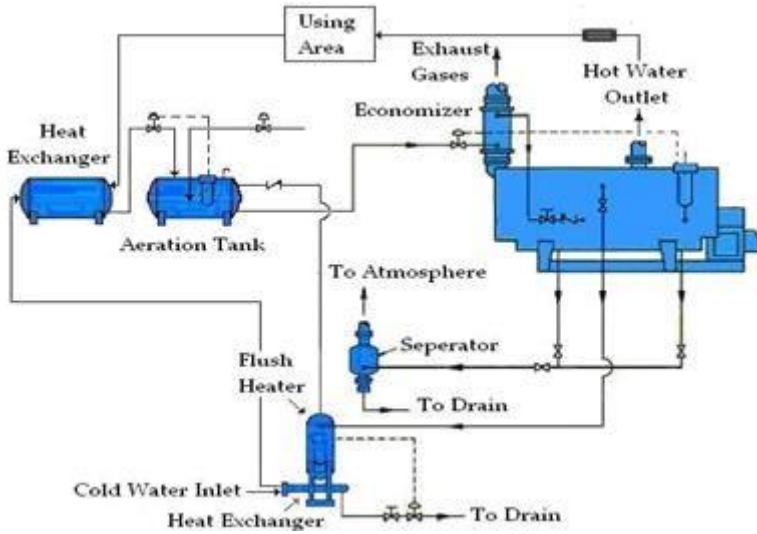
## Solar Collectors

Lime in water moved in solar collectors that are used to utilise heat of sun precipitates in collector pipes and block them forming lime scales at high temperatures. Lime scales which cover inside surfaces of collector pipes prevent heat transfer and decrease efficiency of solar collector and on the other hand, block collector pipes and thus they resist to water flows.





**Akai Magnetic Lime Scale Preventing Devices**, can be installed water inlet pipes of houses and prevent washing machines, dish washers, combo heaters and solar collectors against to lime scale formation. In order to protect radiator water heating lines of combo heaters, second ones should be intalled.



## Central Heating Units

Calcium carbonate (lime) in water finds optimum medium to impede heat transfer to water precipitating on heat transfer surface of devices such as boilers, exchangers etc. As you

know, high temperatures

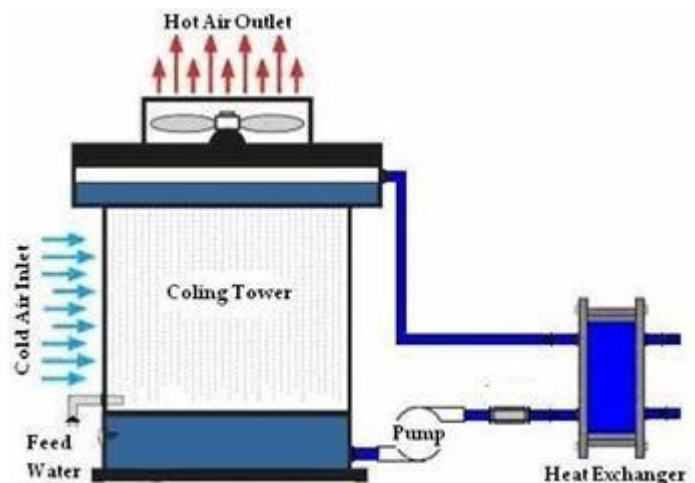
help to build up optimum medium

for lime to precipitate in pipes, and heat transfer surface of boilers and heat exchangers.

## Air Conditioning Systems

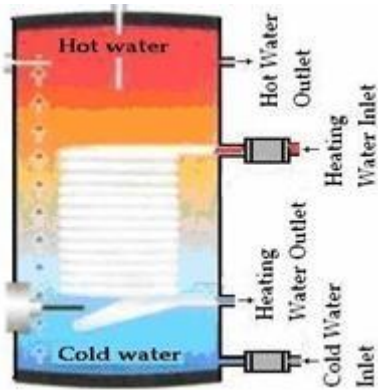
Air conditioning systems in which water is used as an heating and cooling medium function to heat and to cool ambient air as well as humidifying of it with the aim of water.

Water of which is good heat transfer fluid causes lime scale and corrosion formation in air conditioning systems due to lime ( calcium carbonate) and oxygen content.



## Boilers

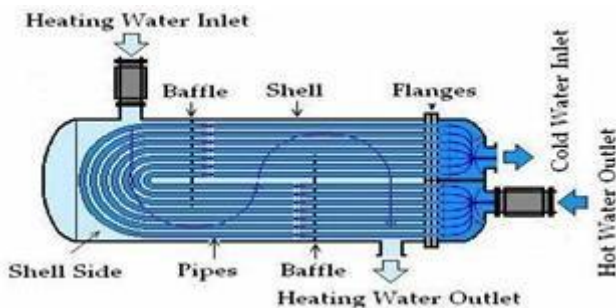
With the aim of preparing hot domestic water, boilers are used to heat cold water which comes from central heating units or other heat sources such as solar collectors etc.



Boilers are faced with formation of lime scale and corrosion at not only hot side but also at cold side of heat transfer surfaces while they heat cold water by using heat of warm water.

Don't struggle with higher fixed investment cost, in addition filters, salts and resins expenditures that reaches to thousands while preventing central heating units, air conditioning systems and boilers against to lime scale and corrosion formation preferring chemical water treatment systems

Protect your expensive central heating units, air conditioning systems and boilers with **Akuaka Magnetic Lime Scale Preventing Devices** which prevent lime scale and corrosion formation and dissolve also present lime scale. Then your central heating units, air conditioning systems and boilers will function effectively and thus save money!



### Heat Exchangers

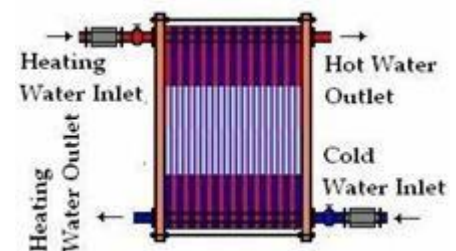
Heat exchangers are the devices in which cold water are preheated by transfer of waste heat from hot water to it.

There are two types of heat exchanger such

as shell and tube, and plate.

In shell and tube heat exchangers, heating water places out of pipes while cold water places in pipes and heat transfer exist throughout of pipes surfaces.

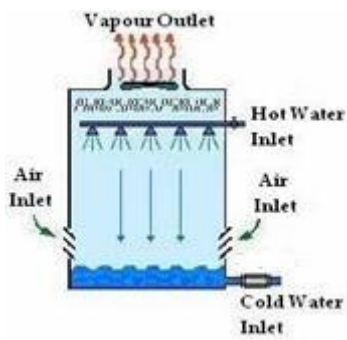
In plate heat exchangers, heating and cold water places volumes between plates and heat are transferred from hot water to cold water through plate surfaces.



### Cooling Towers

At some industrial plants, recovery of heat, or cooling of hot liquids is essential necessity as well as production and use of heat. For this necessity, process, or warm cooling water needs to cool in cooling towers after they are used. At the time of cooling operations, lime in water forms scales and oxygen causes corrosion in cooling towers.





## Thermal and Gas Power Plants

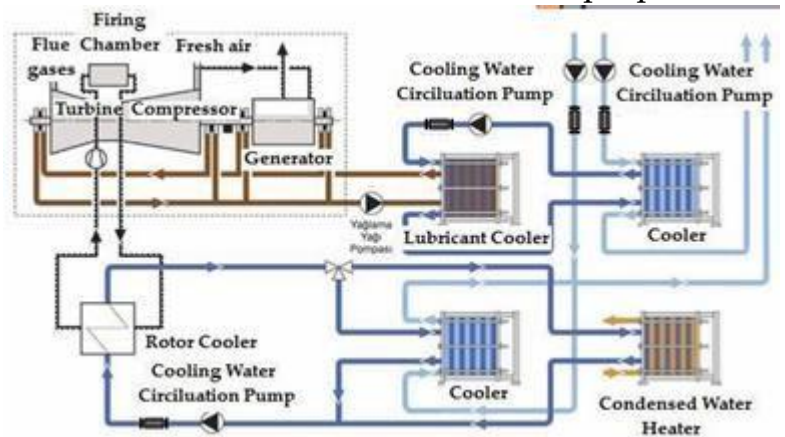
Cooling waters which consist of 95

% of waters used in thermal and gas power plants are obtained from different sources (rivers, lakes, seas or wells).

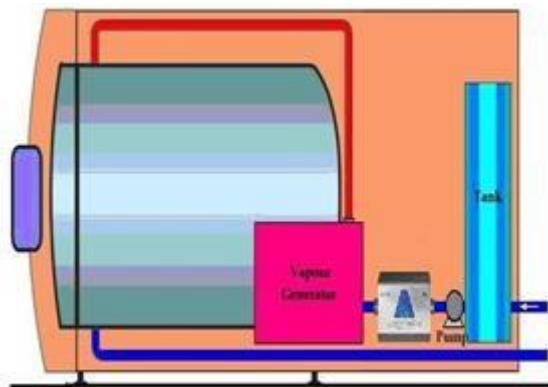
These sources of water generally include high quantities of lime, other minerals etc. and thus cooling water needs to be treated

before use.

As inhibitors, polyphosphates, polyphosphonates and polymers are used to inhibit lime in cooling waters. The quantity of inhibitors which will be used varies with properties and hardness of waters. The quantities of water used in power plants are too much, for this it needs to use huge quantities of inhibitors even though the water includes very few lime. Because of this reason, to overcome lime in cooling water, one needs to spend more money and it constitutes a major item in working expenditures.



You can prevent cooling waters against formation of lime scale and corrosion, and dissolve also existent lime scales formed previously without any expenditure except fixed cost with **Akuaka Magnetic Lime Scale Preventing Devices.**



### Autoclaves

Lime scale formation in autoclaves can be prevented using pure waters, or softening of water by using inhibitors or in chemical water treatment systems.

Although use of pure water is the best measure to prevent lime scale, but is a more expensive way due to obtaining of it by distillation requires using much electricity.

Similarly, continuous use of inhibitors, or salt and need to replacement of carbon filters and resins in chemical water treatment systems to prevent autoclaves against lime scales are not a cheaper way also.

## Dental Units

To prevent formation of lime scales in dental units, the only way is to use of pure water, excluding the use of magnetic lime scale preventing devices. The use of pure water with the aim of preventing the dental units against to lime scale formation is the best but not a cheaper way because of it need to use of distillation devices and consumption of electricity to distil water.



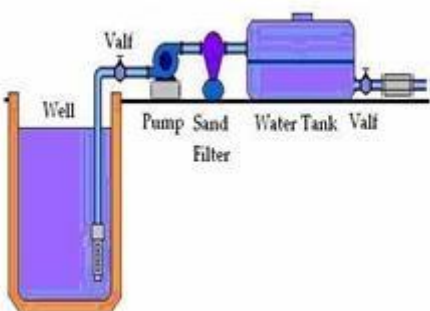
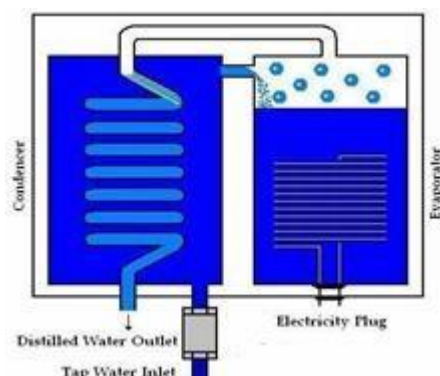
not cheaper materials.

## X-Ray Baths With Water

In X-Ray baths, the x-ray films is washed with water after they are developed using chemicals. Calcium carbonate in water forms lime scale in the surfaces of baths needs to be clean time to time. Generally, in order to prevent lime scale formation in X-ray baths pure water or inhibitors are used but these are

## Pure Water Production Devices

Instead of to use inhibitors continuously and to pay much more money for inhibitors in order to avoid formation of lime scale in surfaces of pure water production devices one can prevent lime scale using **Akuaka Magnetic Lime Scale Preventing Devices** with fixed capital cost only and without any operating expenditures.



**Akuaka Magnetic Lime Scale Preventing Devices** prevent lime scale formation changing crystal structure of calcium carbonate with the effect of magnetic field exerted by magnets and provide all of the devices above mentioned function effectively.

## Irrigation Systems

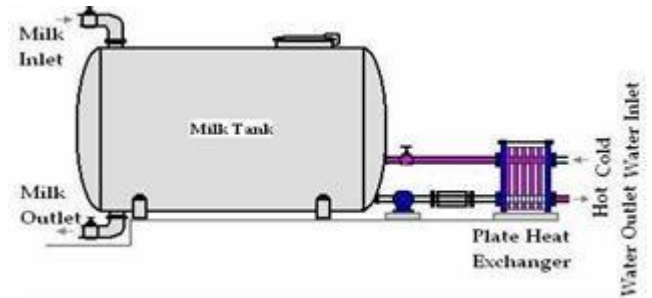
Lime scale formed by precipitation of lime in water which blocks to sprinklers of sprinkling irrigation systems and obscures water flows in drips of drip irrigation systems can be prevented using inhibitors or chemical water treatment systems. The use of phosphate based chemicals is most rationalistic and economic way.

Lime react with phosphate based chemicals and calcium phosphates which are fertiliser formed. Hence irrigation systems are prevented formation of lime scale and soil enriches with phosphates gradually.

Chemical water treatment systems which consist of carbon filter, salt and resin tanks are required to use salt continuously as well as to change carbon filter and resins when they are not function are not suitable to prevent formation of lime scale due to they give salt to soil and are not economical way.

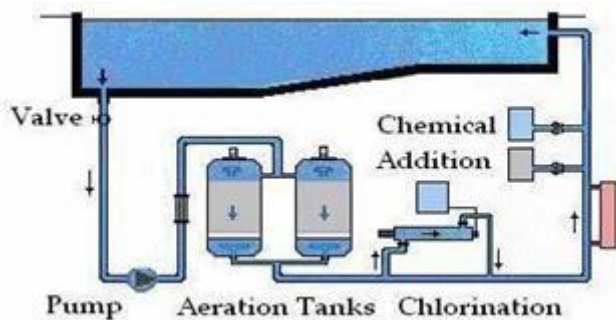
### Milk Cooling Systems With Water

Milk cooling systems are used to decrease temperature of milk. They consist of milk storage tanks and cooling groups.



Generally gas or water are used as a cooling medium in milk cooling systems.

In order to prevent lime scale formation in the irrigation and milk cooling systems prefer **Akuaka Magnetic Lime Scale preventing Devices**. Magnetic effect provides increase of crop yields also.



### Swimming Pools

It is funny to cool in swimming pools at hot summer's days. In the other hand, there is a boring face of swimming pools: To clean of pools and to prevent formation of lime scale in pumps and installations, and also pools walls.

Pools can be cleaned with cleaning materials and formation of lime scale and algae can be prevented by inhibitors. In general, inhibitors used in pools in order to prevent to grow algae and to form lime scale are expensive chemicals. With high expenditures increasing according to hardness of water and renewing frequencies of pools water to use inhibitors are very expensive way.

Formation of lime scale and corrosion, additionally algae growth in swimming pools can be prevented economically using only **Akuaka Magnetic Lime Scale Preventing Devices**.



### Thermal Cure Centers

Thermal cure centers are faced with important problems arising from lime in thermal waters that they include a lot of minerals.

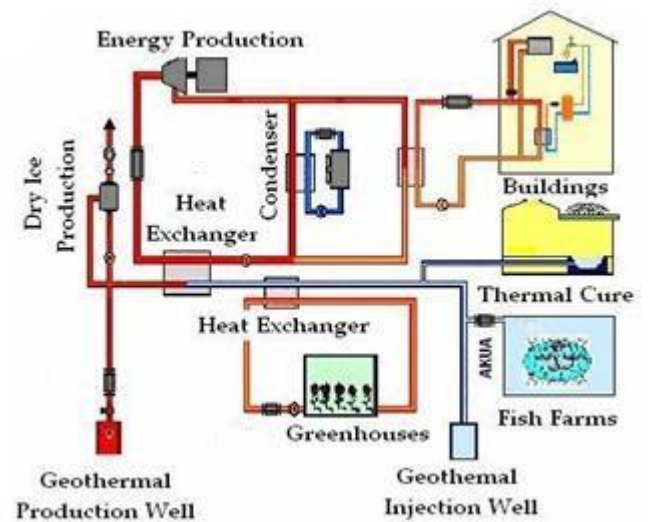
Lime in thermal waters forms hard lime scales which adhere to surface of pipes and installations due to leaving of carbon dioxide with the promotion of decreasing pressure and high temperature.

One way to prevent formation of lime scales in pipes and installations of thermal cure centers is the use of inhibitors. Huge quantities of inhibitors need to be spent for thermal waters which include even low quantities of lime due to higher volumes of thermal waters are used.

### Geothermal Applications

Geothermal resources can be used heating of buildings, greenhouses as well as production of energy and dry ice. Calcium carbonate and other minerals in geothermal waters are the main cause of the problems in geothermal applications.

Calcium carbonate (i.e. lime) in geothermal waters can cause clogging of pipes and installation from well to the end points when it does not take any measure.



In geothermal applications the only way to prevent lime scale formation is the use of inhibitors which is the very expensive method, except the use of magnetic lime scale preventing devices. Expenditures of inhibitor in geothermal applications vary with flow rates of geothermal waters and also ratio of lime and other minerals. In addition, to buy and stock inhibitors periodically is other trouble.



### Water Distribution Networks

The important problems which are faced with water distribution networks which serve in rural and urban areas are clogging of pipes with lime scales and corrosion products.

Get rid of inhibitors expenditures completely and prevent all pipes and installation in thermal cure centers, geothermal applications and water distribution networks against to formation of lime scale and corrosion, meanwhile dissolve existent scale formation which formed previously using **Akuaka Magnetic Lime Scale Preventing Devices only.**



## Ready-Mixed Concrete and Prefabricated Building Elements Facilities

When manufacturing ready-mixed concrete and prefabricated building elements, in order to provide compressive strength of concrete to comply with legislation or technical requirements quality of aggregates and cements used are observed. But, the important matter that don't remind is quality of water.

Water, is a key element of concrete, includes calcium carbonate (i.e. lime) that will be harmful for concrete.

Calcium carbonate is dissolved in the presence of carbon dioxide and leaves pores in concrete. Then these pores decrease compressive strength of concrete. Similarly, calcium hydroxide calcifies in the presence of carbon dioxide and form calcium carbonate. Calcium carbonate causes also decrease in compressive strength of concrete.



**Dou you know that it is possible to increase of compressive strength of ready-mixed concrete and prefabricated building elements between 10-20 % using same aggregates and cements and water passed in **Akuaka Magnetic Lime Scale Preventing Devices?****

## DVGW

Water Technology Center  
Karlsruhe Water Laboratory  
Karlsruhe, Germany



There isn't any standard and technical specification relevant to magnetic lime scale preventing devices in the World. The test method which is used to determine effectiveness of lime scale preventing devices is "DVGW W 512", a technical worksheet developed by DVGW.

DVGW is an organisation which has got very prestigious statue in Europe, which

has a history of 150 years.

### Analytic Results

Table 2.1 First Test Series (Test Rigs 1 and 3 are "blind" or untreated)

Ca <sup>2+</sup> + Mg <sup>2+</sup> (mol)	Test Rig 1 (untreated)	Test Rig 2 (ScaleStop)	Test Rig 3 (untreated)	Test Rig 4 (ScaleStop)
Heating coil	0.414	0.001	0.455	0.001
Container Walls	0.622	0.000	0.691	0.000
Residual >500 µm	0.180	0.011	0.121	0.000

Table 2.2 Second Test Series (Test Rigs 2 and 4 are "blind" or untreated)

Ca <sup>2+</sup> + Mg <sup>2+</sup> (mol)	Test Rig 1 (ScaleStop)	Test Rig 2 (untreated)	Test Rig 3 (ScaleStop)	Test Rig 4 (untreated)
Heating coil	0.001	0.448	0.001	0.470
Container Walls	0.001	0.513	0.001	0.579
Residual >500 µm	0.002	0.189	0.000	0.172

$$\text{Effectiveness Factor} = \frac{M [\text{Ca}^{2+} + \text{Mg}^{2+}]_{\text{untreated}} - M [\text{Ca}^{2+} + \text{Mg}^{2+}]_{\text{treated}}}{M [\text{Ca}^{2+} + \text{Mg}^{2+}]_{\text{untreated}}} = 0.996 \text{ (99.6\%)}$$

Effectiveness of magnetic descalers that manufactured in Europe was found 99.6 % when tested according to W 512. This

effectiveness value are valid to those. But they give knowledge about effectiveness of magnetic lime scale preventing devices.

### **PREVENTS LIME SCALE!**

**Akuaka Lime Scale Preventing Devices;**  
**prevent lime scale formation changing crystal structure of calcium carbonate in water**

### **DISSOLVES LIME SCALE!**

**Akuaka Lime Scale Preventing Devices; dissolve present lime scale with the magnetic effect which is transported by dissolved minerals in water**

### **PREVENTS CORROSION!**

**Akuaka Lime Scale Preventing Devices; prevent corrosion formation decreasing the activity of minerals dissolved in water**

**NO ELECTRICITY!**

**NO USE OF CHEMICALS!**

**IN ADDITION**

**MAINTENANCE FREE AND NO OPERATIONAL COST!**

**Lime Scale Formation in Installation and Devices Causes  
Economical Lost! Choosing of Wrong Method or Devices in The Fight Against to Lime  
Scale Causes Economical Lost Also!**

**Prefer Akuaka Lime Scale Preventing Devices in The Fight Against to  
Lime Scale  
Win Not Only The Fight Against to Lime Scale But Also Not Meet With Economic  
Difficulties!**

**Dou You Know Akuaka Lime Scale Preventing Devices  
Are in Services Everywhere From Houses To Industry in Turkey Since 1995?**

**The Users of Akuaka Lime Scale Preventing Devices That Apart 15 Years  
Live in Pleasant As Well As Fighting Against to Lime Scale Economically**

**Akuaka Lime Scale Preventing Devices, With Buying Cost Only, Give  
For 50 Years Services Maintenance Free and Without Operational Cost Also**

#### **Akuaka Foreign Trade Limited Company**

which started to show activity by importing magnetic lime scale preventing devices from  
Germany and United States at 1995,  
have been manufacturing magnetic lime scale preventing devices since 2006.

#### **Akuaka Foreign Trade Limited Company**

manufactures magnetic lime scale preventing devices which  
has nominal diameters from 1/2" to 40".

Akuaka supply magnetic lime scale preventing devices of nominal diameters from 40" up to  
144"

importing them when they are demanded.

#### **Akuaka Foreign Trade Limited Company**

continues its leadership,

achieves by importing and supplying magnetic lime scale preventing devices to Turkish market,  
manufacturing Turkey's most powerful magnetic lime scale preventing devices using AISI 304  
stainless steel materials and neodymium iron bor (NdFeB) magnets which have 14500 Gauss  
magnetic flux density.