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VFD Fields Application

CHINT Global Overseas Marketing

智慧能源解决方案提供商

2020.07.31

Product Management team for oversea MKT

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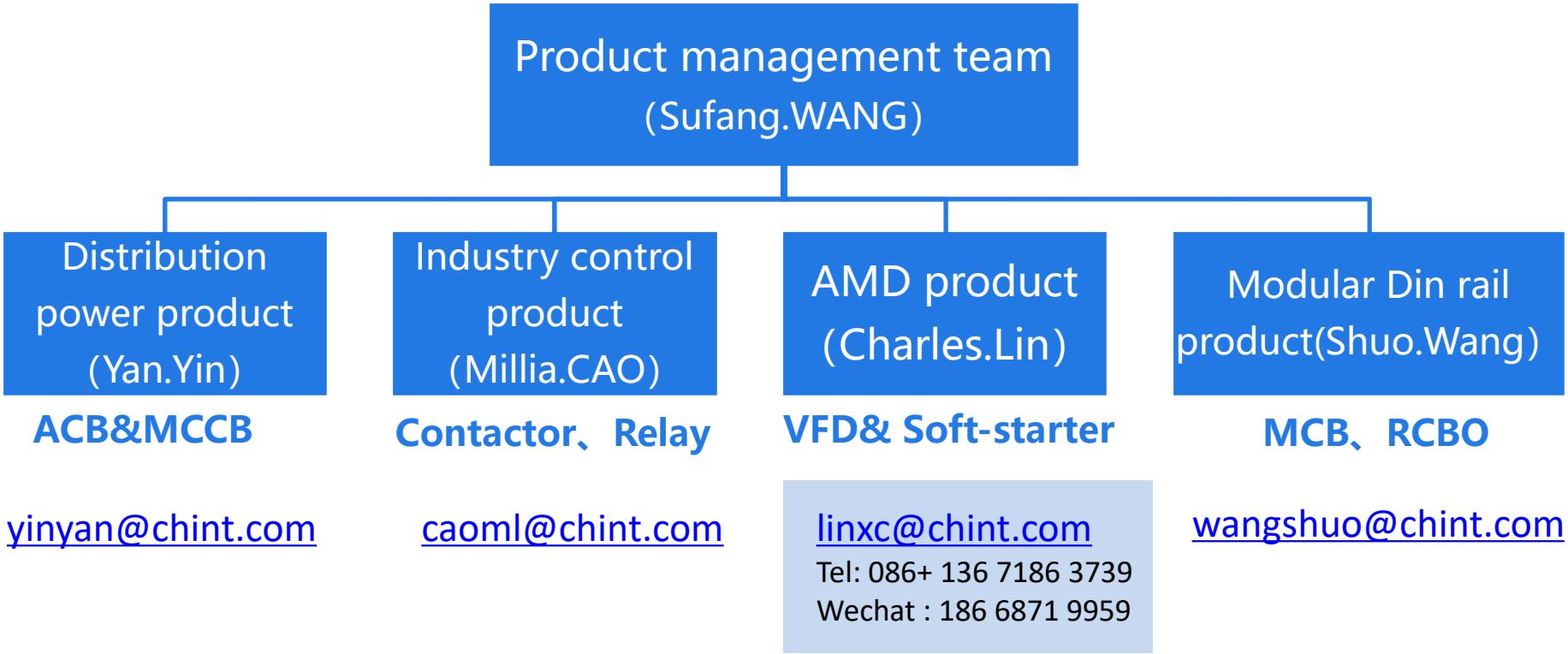

About me

Charles Lin	
2012-2016	Bachelor Degree at University of Science and Technology Beijing
2016-2018	Master Degree at University of Glasgow
2018-2020	Emerson Climate Technologies (Shanghai) co. Ltd FAE (field application engineer)
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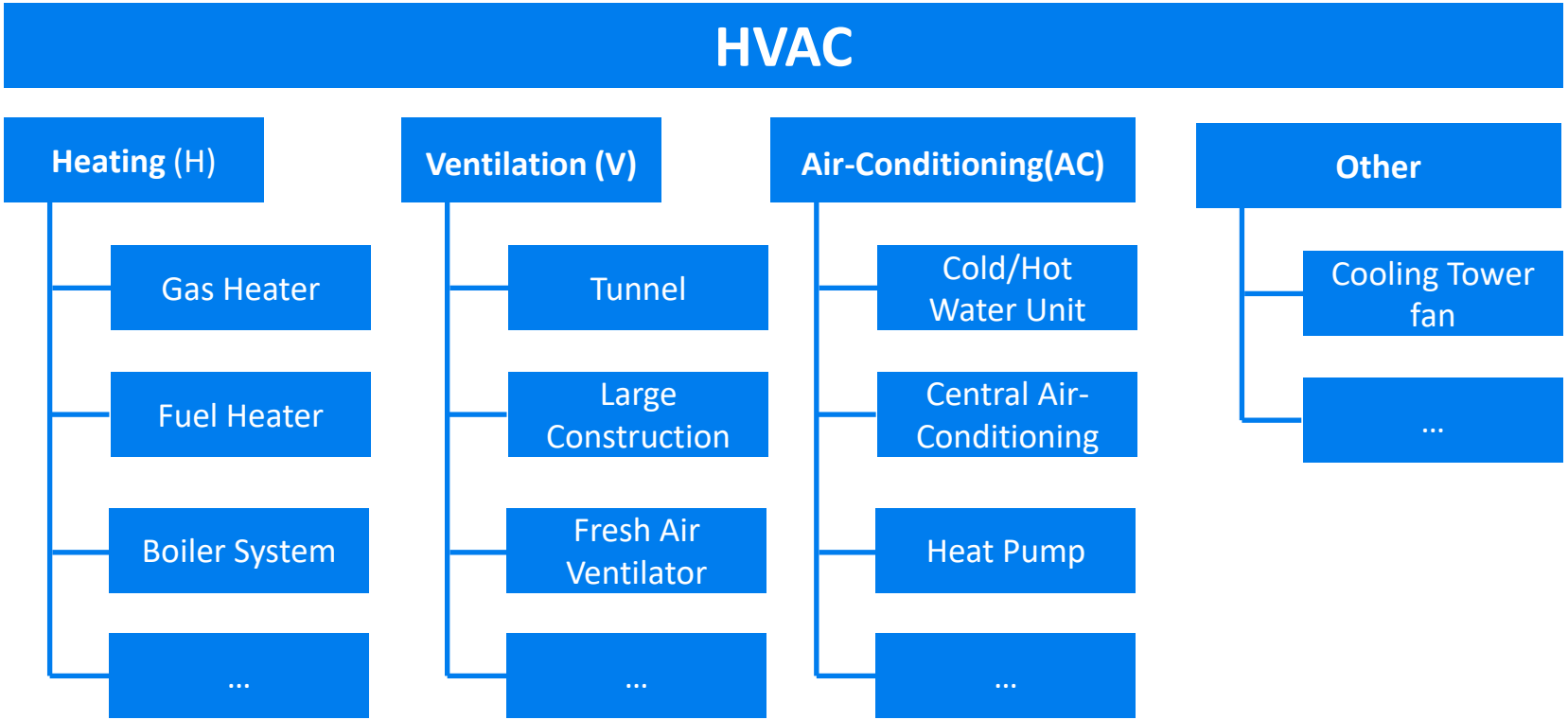
HVAC

What is HVAC ?


HVAC
Heating (H)
Gas Heater
Fuel Heater
Boiler System
...
Ventilation (V)
Tunnel
Large Construction
Fresh Air Ventilator
...
Air-Conditioning(AC)
Cold/Hot Water Unit
Central Air-Conditioning
Heat Pump
...
Other
Cooling Tower fan
...

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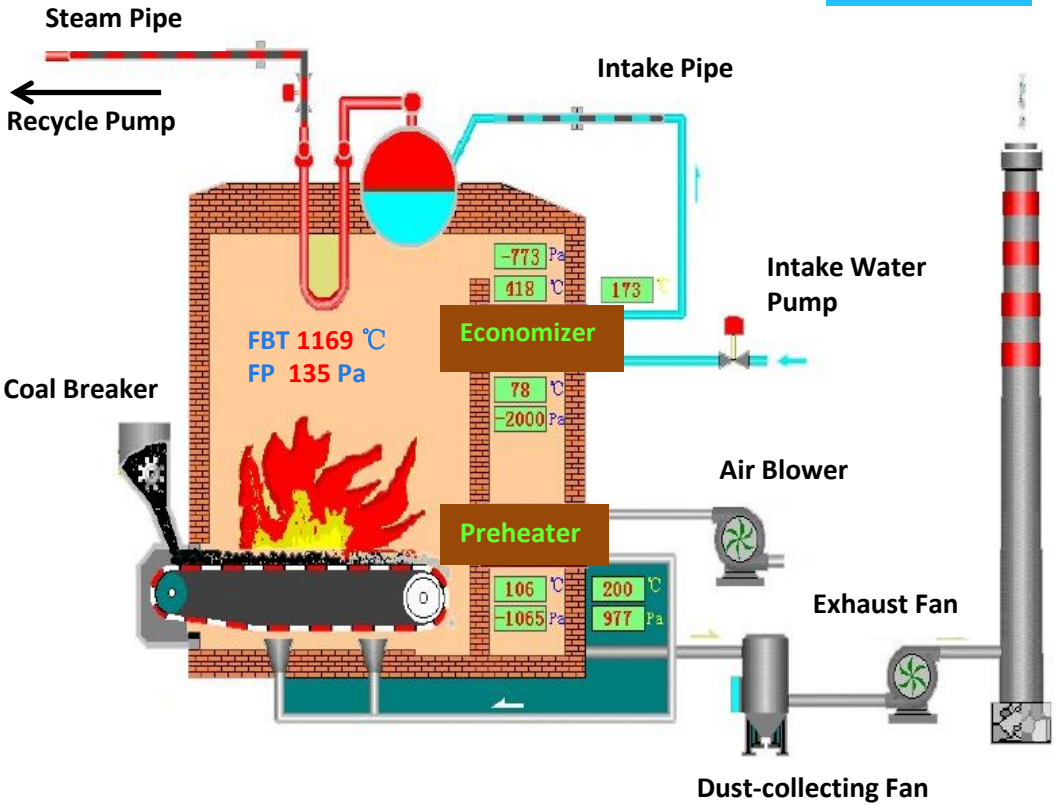
Heating system

---Boiler room system

Boiler Room system

In this system, the VFD or soft-starter can be applied :

No	Point	Function
1	**Air Blower**	To improve the combustion efficiency Make the water reach the setting Temp.
2	**Exhaust Fan**	To sustain the ratio of air & coal, to maintain the FP within limitation
3	**Recycle Pump**	To reach the recycle of heating system
4	**Intake Water Pump**	To replenish the water
5	**Conveyor**	To control the number of coal



Note.
FBT (furnace box temperature)
FP(Furnace pressure)

VFD Application

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As example, how many VFD or soft-starter will be applied in a 40 ton hot-water boiler system ?

Air Blower	75 Kw VFD	**NVF2G**
Exhaust Fan	132Kw VFD	**NVF2G**
Recycle Pump	Power depends on the heating area and system allocation (one using with one backup)	**NJR2/NVF2G**
Intake Water Pump	22Kw VFD (one using with one backup)	**NVF2G**
Conveyor	1.1-11Kw VFD (7-35 Hz)	**NVF2G/NVF5**

In general, the air blower and exhaust fan will be controlled by VFD.

- Energy efficiency
- To sustain the ratio of air & coal
- the power of air blower and exhaust fan is large, using the VFD to control will reduce the impact of power grid

The recycle pump is important for the hot-water boiler system. In order to avoid the pipe or boiler exploded, the backup is necessary. There are some different combination:

- Two VFD
- One VFD & one soft-starter (Most)
- Two soft-starters

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Ventilation system

--- Tunnel

Ventilation system – Tunnel

In the tunnel ventilation system there are two different type, jet fan & axial flow fan.

	Jet Fan	Axial Flow Fan
Power	22~55Kw	160~500Kw
Equipment	Soft-starter	VFD
Market	Large	Small
Situation	Most Tunnel	More than 4km with poor atmospheric conditions
Installation	Ceiling each 150m	An Air flue from inside to outside

Ventilation system – Construction

At present, the ventilation system is applied in agriculture, industrial construction, underground space.

	Jet Fan
Power	22~55Kw
Equipment	Soft-starter/VDF
Model	NJR2&NVF2G
Market	Large
Situation	Building, Industrial construction
Requirement	1. Reliability (The frequent start and stop) 2. Communication (Centralized control) 3. Water proof High IP level(For some Outdoor applications) 4. Low noise

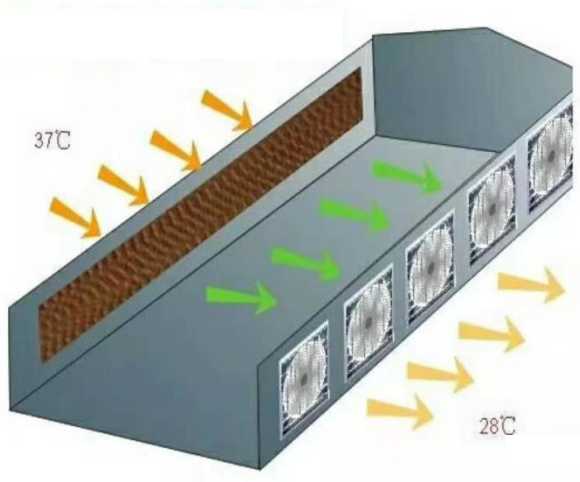
Construction

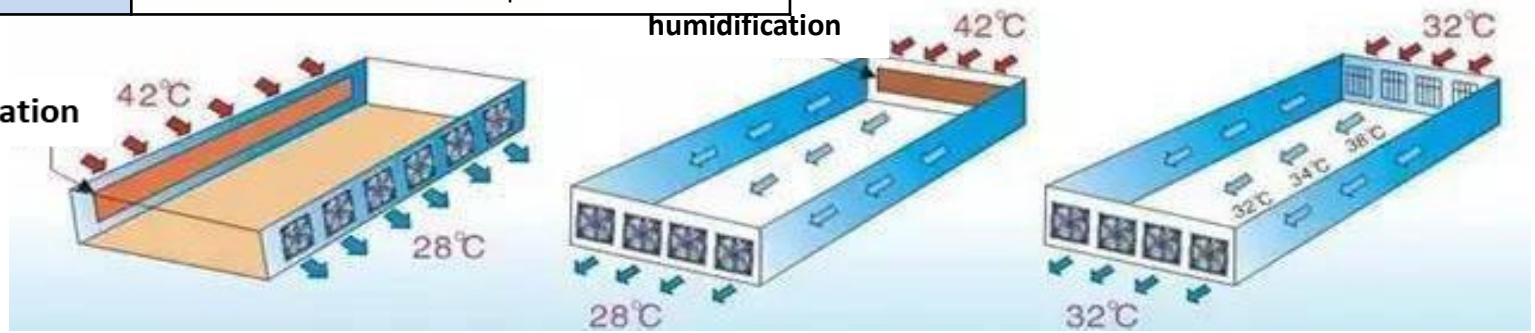
Factory

Ventilation system – Stock farming

This system is applied in stock farming widely. For example, a chicken coop is 100m length, 12m width, 3.8m eave and 1.5m ridge. There will be 5~7 air fans (5~20Kw).

	Air Fan
Power	5~20Kw
Equipment	Soft-starter or VFD (NJR2/NVF2G)
Situation	Stock farming, greenhouse
Requirement	1. Reliability (The frequent start and stop) 2. Communication (Centralized control) 3. Low noise 4. Cheap





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Construction VFD Application

Construction VFD Application

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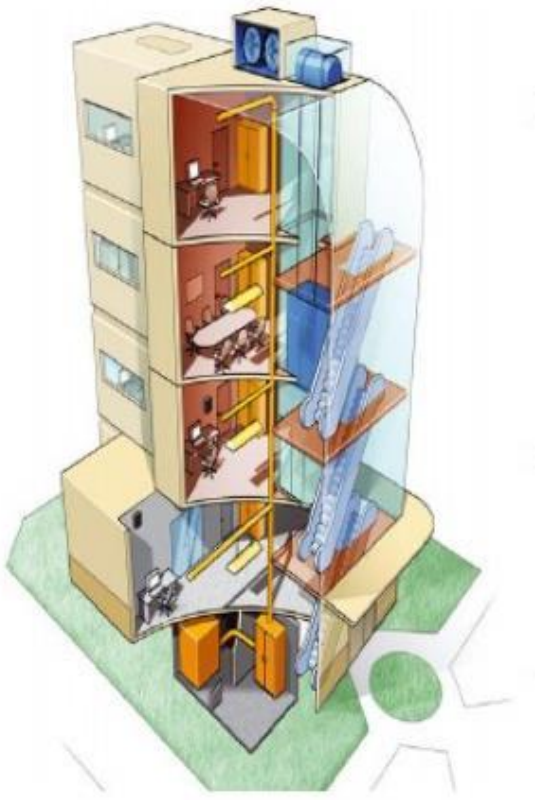
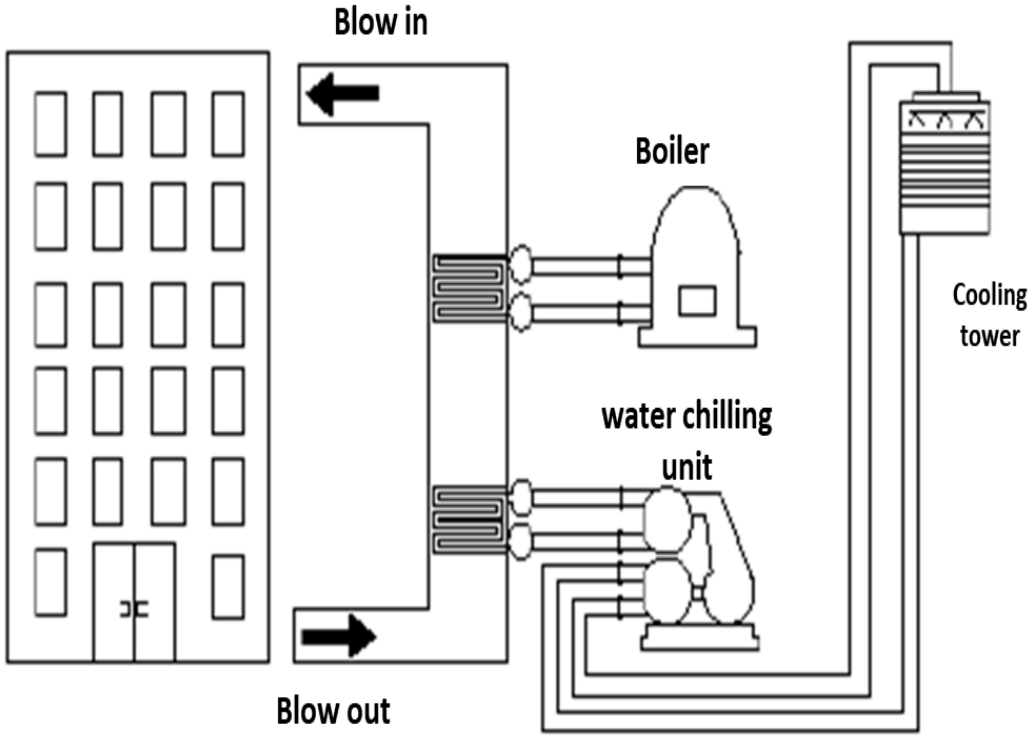
It is great potential that VFD application in commercial building. According some research, there will be $ 7,000 ~ 22,000 VFD or soft-starter for per 10,000 ㎡ commercial construction.

System	Equipment	Loading Type	CHINT Product
Ventilation system	Exhaust Air /Ventilation	Fan	NVF 2G& NJR 2
	Elevator Shaft	Fan	NVF 2G & NJR 2
Central Air-Conditioning	AC main air-blower	Fan	NVF 2G
	Cooling Water Supply	Pump	NVF 2G/5
	Heating Water Supply	Pump	NVF 2G/5
Fire Protection	Fire Pump	Pump	NVF 5
	Purging system	Fan	NVF 5
Air Purification	Air treatment system	Fan	NVF 2G

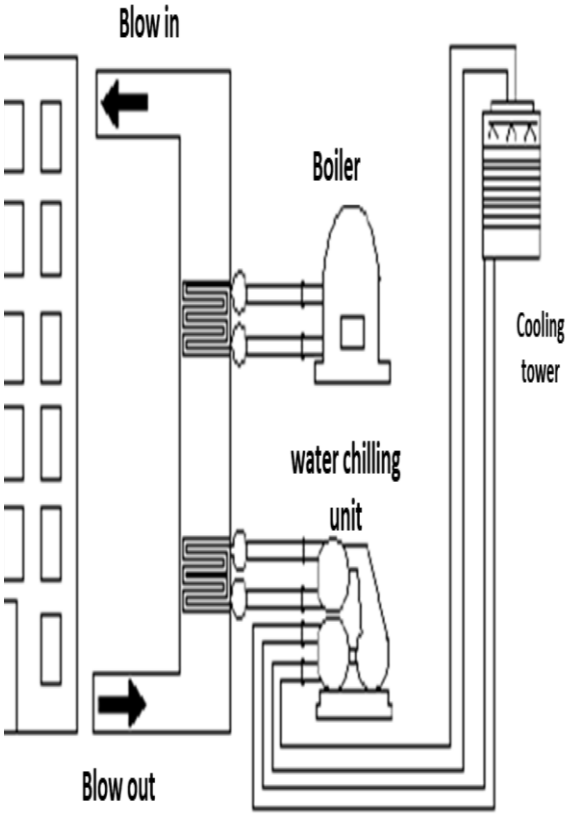


A Simple CAC system

Composition of air-conditioner systems:



A Simple CAC system



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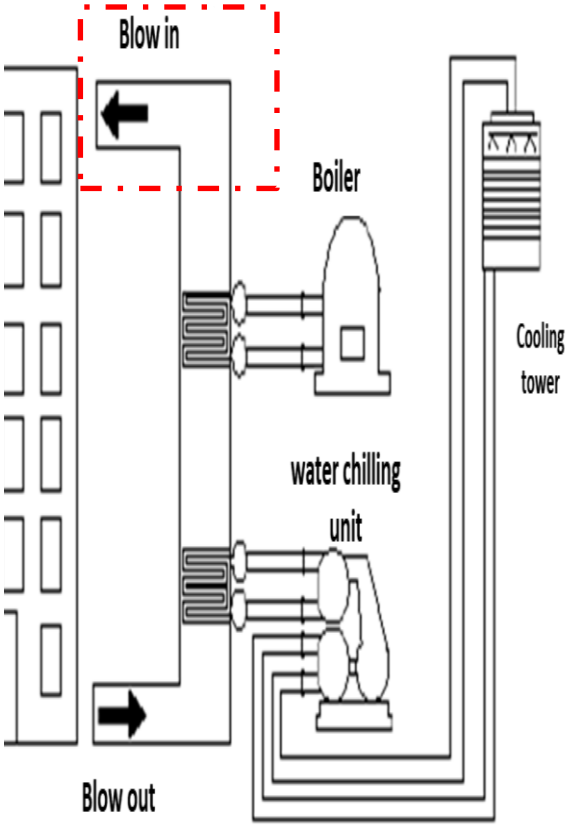
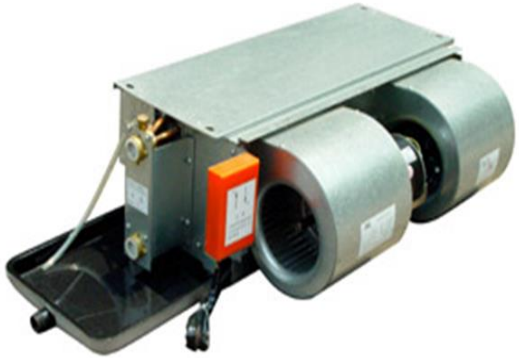
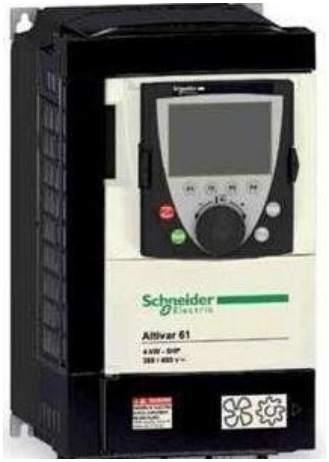




The Blow-in Air Fan	
Function	To Control Temp. by the air volume
Chint Product	NVF2G
Competitor	Schneider ATV61
Power Range	10~20KW

Requirement:

- Automatic start and stop fan
- Continuously speed control - the comfort requirement
- Jumping frequency to eliminate resonant frequency
- Low noise
- PID feed back



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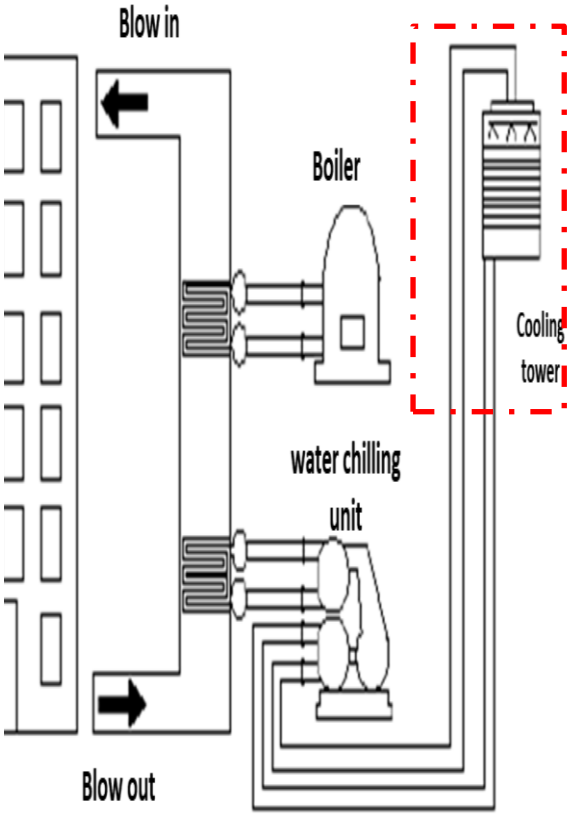

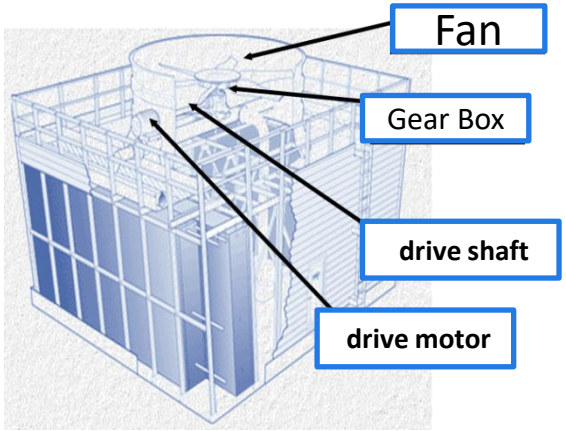

Cooling tower Fan	
Function	Speed control
Chint Product	NVF2G
Competitor	Schneider ATV61
Power Range	20~55KW

Requirement:

- Smooth velocity changes to reduce mechanical impact
- Continuously speed control
- Jumping frequency to eliminate resonant frequency
- Set the lower limitation of frequency to protect the gear box
- PID feedback
- Large starting torque
- ECO

HVAC Industry Requirement

1. Requirement of EMC
2. Requirement of Harmonic
3. Good Communication Protocol
4. Widely Power Range
5. Automatic Energy Optimization (AEO) Function
6. Low noise
7. Protection & Operation Information

Modbus

0.4-460kW

Background

What is water treatment

Water treatment is any process that improves the quality of water to make it more acceptable for a specific end-use.

The end use may be drinking, industrial water supply, irrigation, river flow maintenance, water recreation or many other uses, including being safely returned to the environment.

Water treatment removes contaminants and undesirable components, or reduces their concentration so that the water becomes fit for its desired end-use. This treatment is crucial to human health and allows humans to benefit from both drinking and irrigation use.

Background

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Challenges

- **Cost**

  Optimized cost is always needed by customer. Not only the installation of new equipment's but also the operation cost.

- **Reliability**

  With pumps, motors and other equipment operating 24 hours a day, seven days a week, water facilities should be always keep its productivity and reduce the unexpected emergency breakdowns

- **Safety**

  Protect your facilities like motors/pumps/pipes and so on. Stricter laws of environment protection and drinking water quality also request water facilities to use electrical equipment for improvement.

Background

Main applications in water treatment

Pumps

Widely used in water treatment and take the most consumed energy.

- Energy savings of between 20 and 60 percent are typically achievable.
- Fast response to variations in process demand and optimized energy consumption.
- Quick ramps reduce risk of mechanical stress. and increased service intervals.
- Reduces costs and risk of failure when operating remote sites
- Soft start of motors reduces stress on water and electrical network.
- Reduced water hammer and other mechanical stress, increasing equipment lifetime while avoiding pipe bursts.

Blowers/compressors

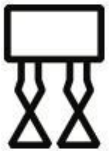
Widely used in waste water treatment and big potential in energy saving.

- Controlling the amount of dissolved oxygen is important to prevent over aeration.
- Energy savings and reduced operations cost.
- Oxygen savings.
- Less mechanical wear.
- Better blower efficiency.
- Better generator stability.
- Harmonics can cause power quality issues in water treatment facilities.
- Drive ensures ultra-low harmonic levels in supply network.

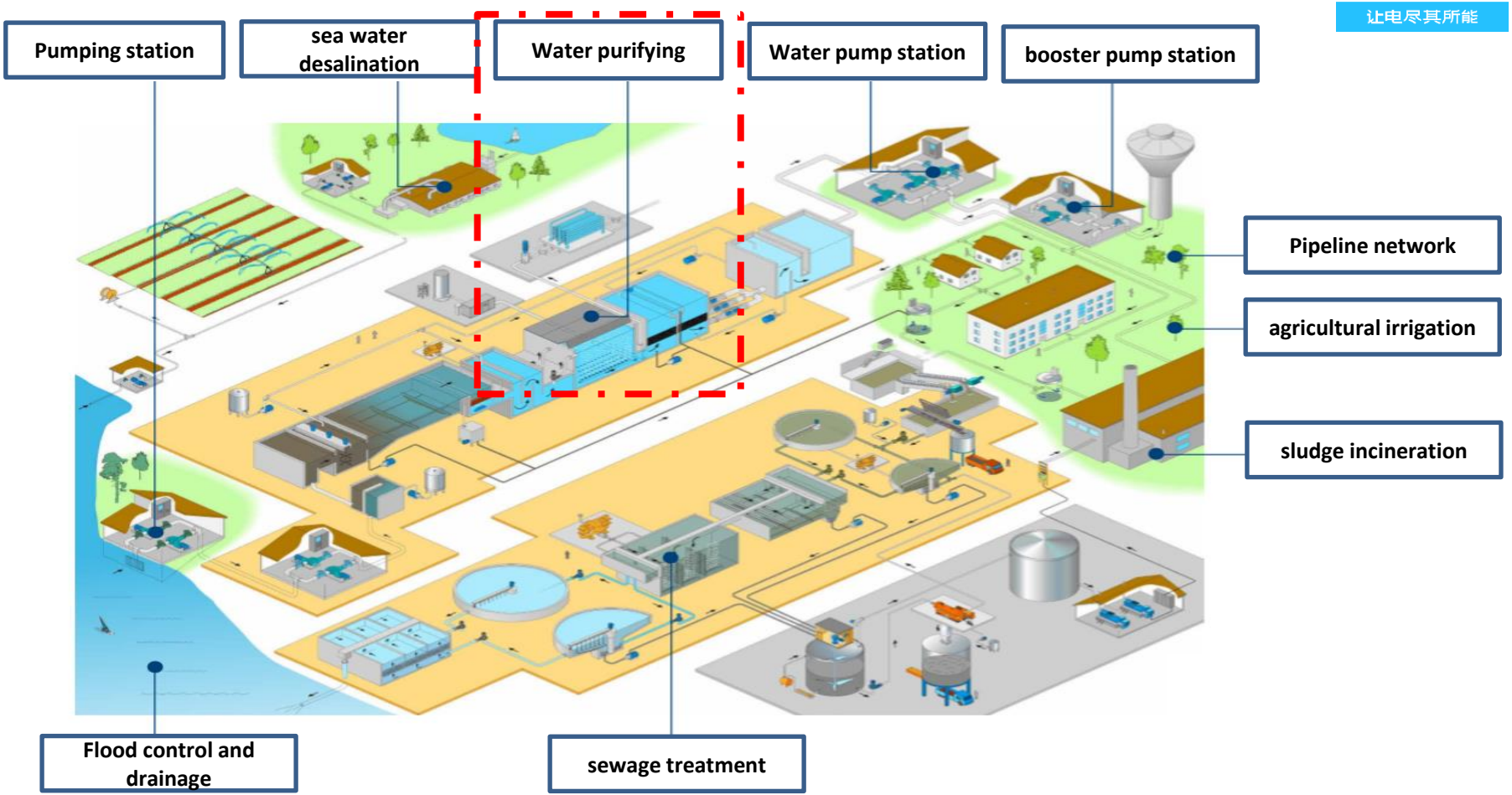
Mixers and others

Mixers are use in adding chemicals process. And there are also some other equipment in Sludge treatment and Disposal process which need speed controls.

- Precise dosage is important to ensure safety while avoiding overuse of expensive chemicals.
- Motor-drive package provides optimal speed control for mixing operations.
- Better mixing quality with precise dosage and reduction of chemical waste
- Drives are used to control the speed in machines like horizontal centrifuge and thickening machines.



Water Treatment



Water purifying

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1 River abstraction / Groundwater extraction

The source of clean water is mainly comes from river or ground water. We mainly use all kinds of pumps to transfer these water to water treatment plants..

Applications: Submersible pumps; Centrifugal pumps; Multi-stage mixed flow pumps.

3 Flocculation/Sedimentation

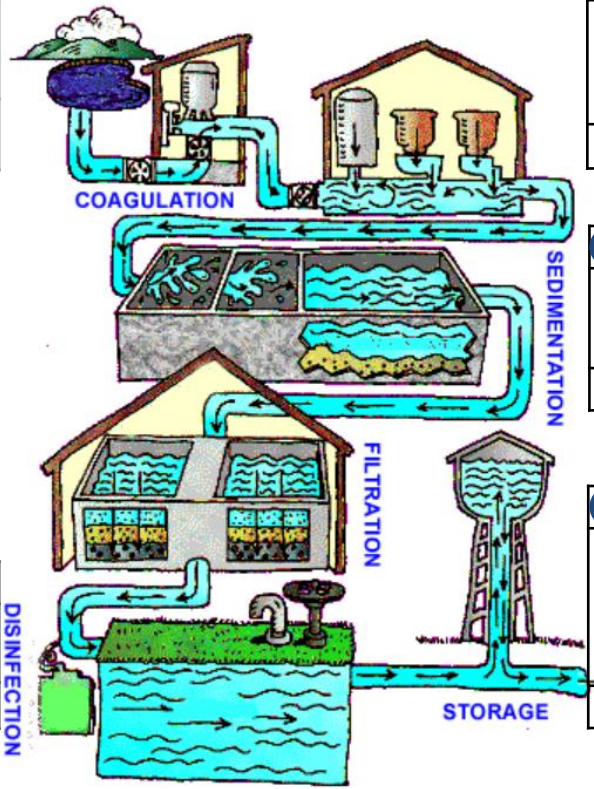
A slow mixing process that causes small coagulated particles to form larger particles, then removes particles suspended in water to reduce the load on the filters.

Applications: Mixers,stirrers,pumps,skimmers, aerators; Filter pumps, aeration compressor

5 Disinfection

Chlorine is used within the disinfection process to kill or inactivate water-borne microorganisms.

Applications: Pumps



2 Chemical coagulation

Chemicals like chlorine dioxide are added to break down matter such as decaying leaves. Aluminium sulfate is used as the main coagulant etc……

Applications: Pumps, mixers

4 Filtration

Water is filtered through a granular material such as coal or sand to remove any final impurities not collected during stage 6.

Applications: Pumps, mixers, skimmers

6 Distribution pump station/Booster station

Transporting large volumes of water through a piped distribution system requires the use of pumping stations. Booster pumps can be used when raising water pressure in a distribution system, such as pumping from ground level to a water tower.

Applications: Centrifugal pumps

Water purifying

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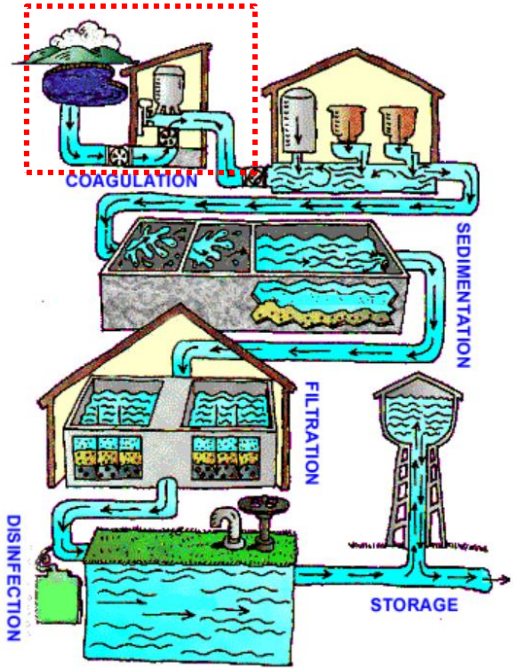
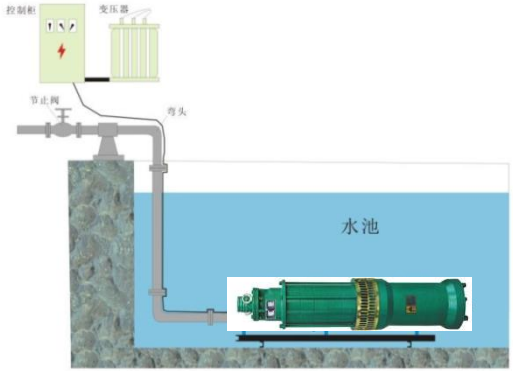
Process



Application or Machine



A Submersible Pumps

Description:
Transfer water from river/lake/underground to water plants.

Challenges:
1:Water hammer effect.
2:Energy saving.
3:High cost of maintains
4:Hand-handle causes low efficiency

CHINT solutions

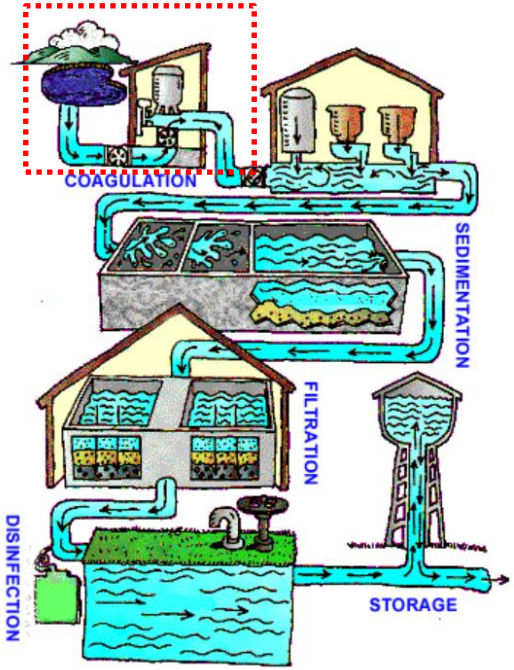
A Chint solutions

Products:
Soft starter: NJR2-D/ZX
Invertor: NVF2G/NVF5

Benefits:
1:Protect pipes system by avoiding Water hammer effect
2:Energy saving 20%-50% deepens on situation
3: Automated handle lower humans and maintains cost.

Water purifying

Process



Application or Machine

B	Lift Pumps
Description: Transfer water to higher plants and generate pressure for transport.	
Challenges: 1:Energy saving. 2:Precise pressure is needed. 3:High maintains cost caused by repair and shorten life cycle.	

CHINT solutions

B	Chint solutions
Products: Soft starter: NJR2-D/ZX Invertor: NVF2G/NVF5	
Benefits: 1:Energy saving 30%-60% deepens on situation 2:Achive needed pressure by adjusting speed of pumps. 3:Pumps alternative and soft starting longer life cycle of pipe system.	

Water purifying

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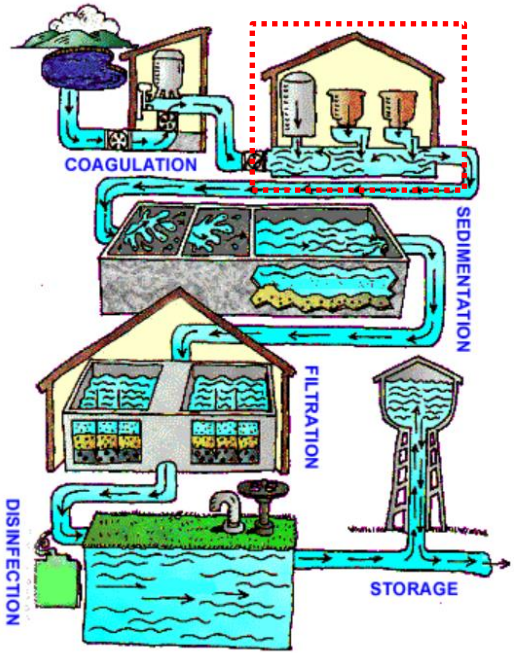
Process



Application or Machine

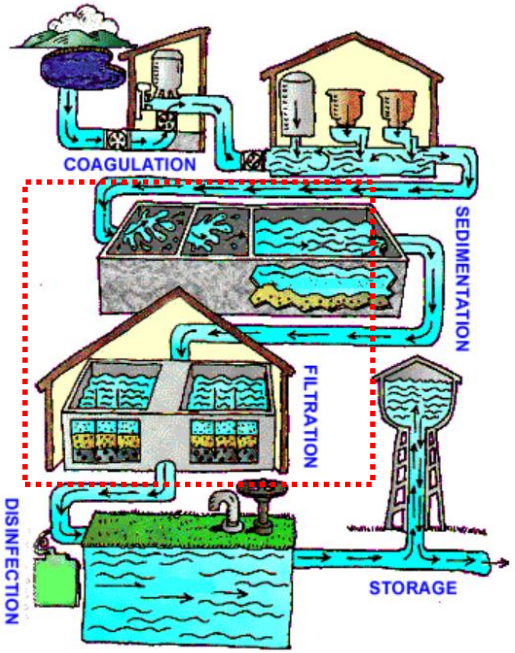
A	Mixer/Metering pump
Description: Mixer to mix the chemical liquid and metering pump to measure the amounts of added.	
Challenges: 1:Energy saving. 2:Precise control of chemical amount.	

CHINT solutions

A	Chint solutions
Products: Invertor: NVF2G/NVF5	
Benefits: 1:Energy saving 10%-20% deepens on situation. 2:Aviod waste of chemical and precise percentage of mixtures.	

Water purifying

Process



Applications or Machines

A Scraper Bridges
Description: Rremove the settled sand, grit and suspended solids deposited at the bottom of settling tanks.
Challenges: 1:Override of motor start current 2:Speed control 3:Energy saving.

CHINT solutions

A Chint solutions
Products: Invertor: NVF2G
Benefits: 1:Satrt the equipment avoid any harm to power grid. 2:Precise speed controls on request. 3:Save energy 10%-30% depends on situation.

Water purifying

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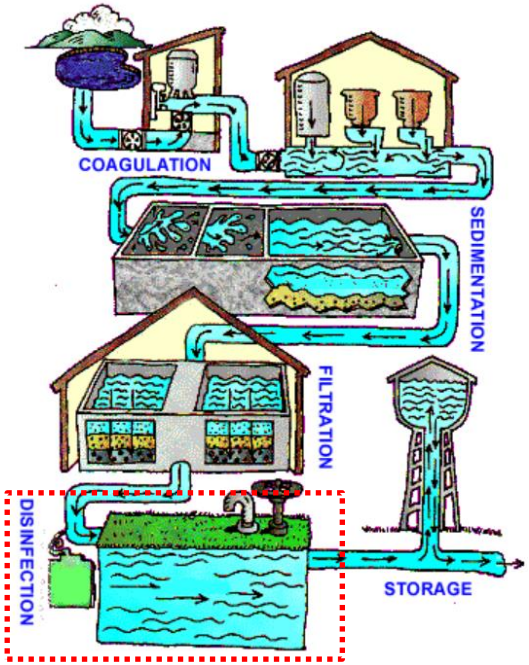
Process



Application or Machine

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Water purifying

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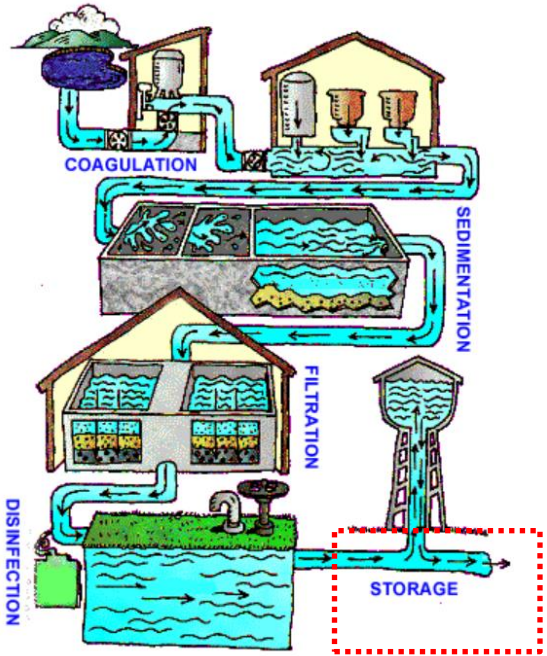
Process



Application or Machine

A Centrifuge Pumps

Description:
Transport clean water to booster stations. Controls the certain pressure to water body in piping system.

Challenges:
1:Energy saving.
2:Precise pressure is needed.
3:High maintains cost caused by repair and shorten life cycle.

CHINT solutions

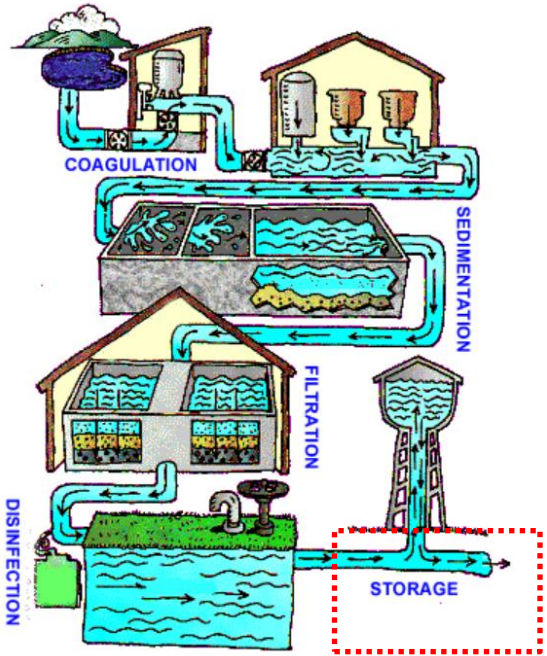
A Chint solutions

Products:
Invertor: NVF2G/NVF5

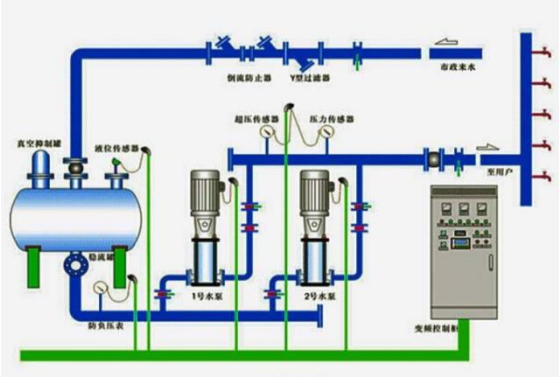
Benefits:
1:Energy saving 30%-60% deepens on situation
2:Achive needed pressure by adjusting speed of pumps.
3:Pumps alternative and soft starting longer life cycle of pipe system.

Water purifying

Process



Application or Machine



B Centrifuge Pumps

Description:
In long water transport distance. Pressure of water is reduced by piping system. Booster stations help on keeping certain pressure to the end user.

Challenges:
1:Energy saving.
2:Precise pressure is needed.
3:High maintains cost caused by repair and shorten life cycle.

CHINT solutions

B Chint solutions

Products:
Invertor: NVF2G/NVF5

Benefits:
1:Energy saving 30%-60% deepens on situation
2:Achive needed pressure by adjusting speed of pumps.
3:Pumps alternative and soft starting longer life cycle of pipe system.

Sewage Treatment

1 Transportation of waste water

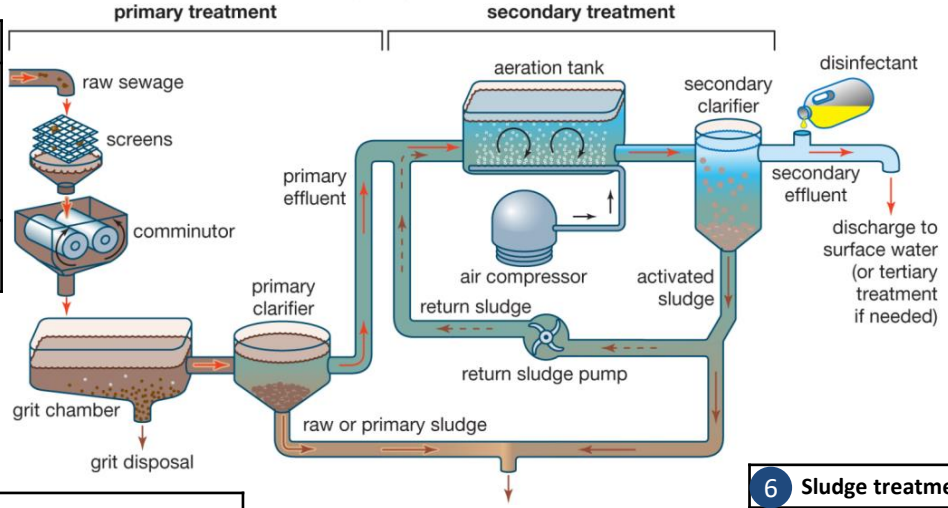
Transportation of waste water, and also generate pressure of waste water to through the screens.

Applications: Centrifugal pumps;

2 Comminution

Comminutor also called sewage Grinders, are shredding and screening devices widely used in wastewater treatment plants. Comminutors break down wastewater solids in plant headworks.

Applications: Rotary machines; Speed controls



3 Aeration

In a typical wastewater treatment plant, aeration blowers are the largest single consumer of energy. One of the major energy efficiency improvement areas appears in changing the way by which air flow into aeration basins is controlled, from flow control valves (FCV) to blowers speed control by a VFD. Results show up to 50% energy savings.

Applications: Blowers;

4 Transportation of finished water

Transportation of finished water, for necessary next steps of treatments or to rivers

Applications: Centrifuge pumps;

5 Transportation of mud water

Transportation of the mud water

Applications: Mud pumps;

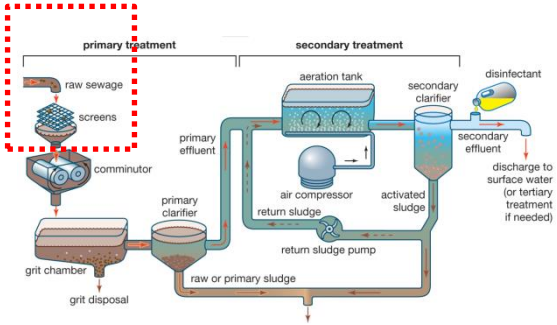
6 Sludge treatment and Disposal

Sewage sludge is the solid, semisolid, or slurry residual material that is produced as a by-product of wastewater treatment process. The process includes Thicken/Digestion/Dewatering and Disposal.

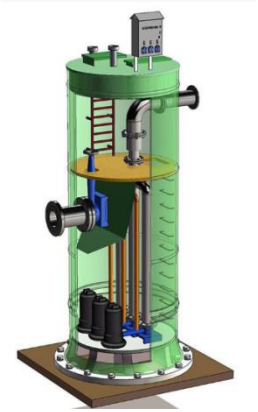
Applications: Rotary machines and Conveyers

Sewage Treatment

Process



Application or Machine



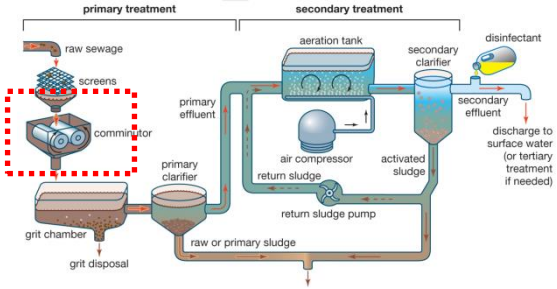
A	Lift Pumps
Description: Transport waste water from anyway to the plants.	
Challenges: 1:Energy saving. 2:Provide pressure for water transportation. 3:High maintains cost caused by repair and shorten life cycle.	

CHINT solutions

A	Chint solutions
Products: Invertor: NVF2G/NVF5	
Benefits: 1:Energy saving 30%-60% deepens on situation 2:Protect piping system and power grid. 3:Pumps alternative and soft starting longer life cycle of pipe system.	

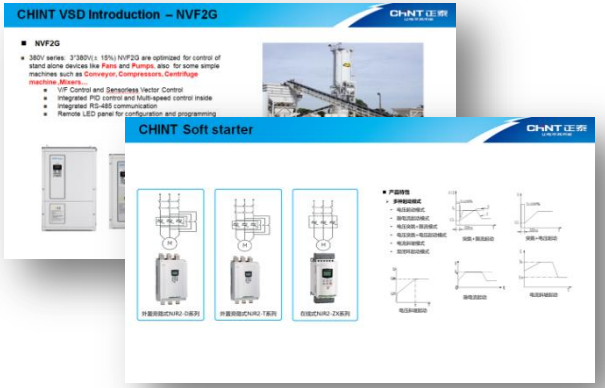
Sewage Treatment

Process



Application or Machine

CHINT solutions



A Comminution

Description:
Also called "Sewage Grinder" which used to reduce the particle size of wastewater solids.

Challenges:
1:Override and unbalance of running current
2:High maintains cost caused by repair and shorten life cycle.
3:Energy saving.

A Chint solutions

Products:
Soft starter: NJR2-D/ZX
Invertor: NVF2G/NVF5

Benefits:
1:Soft start and soft stop of motor.
2:Easy to maintained and control.
3:Saving energy depends on situation.

Sewage Treatment

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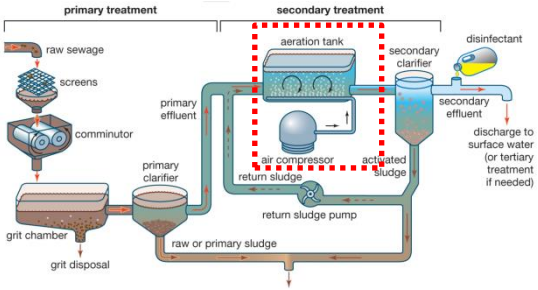
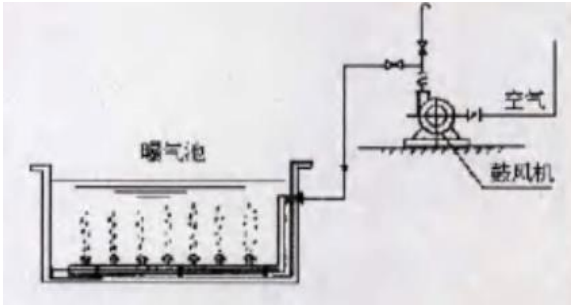
Process



Applications or Machines



CHINT solutions

A Aeration

Description:
Aeration is the most important part of waste water treatment to control consistency of dissolved oxygen. And it consumes 40%-70% energy of whole plants.

Challenges:
1:Energy saving.
2:High maintains cost caused by repair and shorten life cycle.

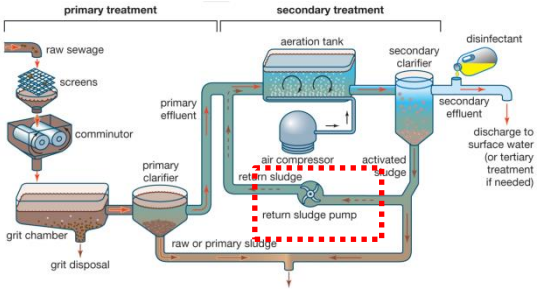
A Chint solutions

Products:
Invertor: NVF2G/NVF5

Benefits:
1:Energy saving 30%-60% deepens on situation
2:Easy to maintained and control.

Sewage Treatment

Process



Applications or Machines

A Sludge pump
Description: Collect sludge(mixed with water) and transport them to next steps.
Challenges: 1:Big lash to motors/pumps and power grid 2:Energy saving. 3:High maintains cost caused by repair and shorten life cycle.

CHINT solutions

A Chint solutions
Products: Invertor: NVF2G/NVF5
Benefits: 1:Soft start/soft stop and protect mechanic parts of equipment. 1:Energy saving 30%-60% deepens on situation 2:Easy to maintained and control.

Sewage Treatment

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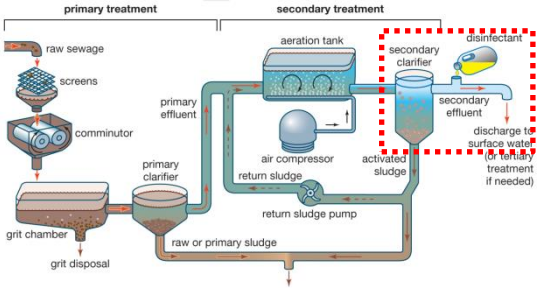
Process



Application or Machine

CHINT solutions

A Centrifuge Pumps

Description:
Transport clean water to booster stations. Controls the certain pressure to water body in piping system.

Challenges:
1:Energy saving.
2:Precise pressure is needed.
3:High maintains cost caused by repair and shorten life cycle.

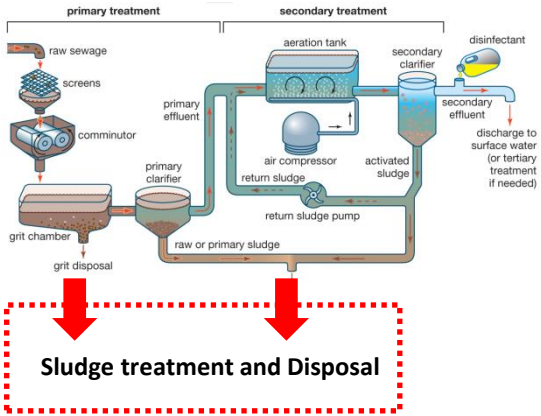
A Chint solutions

Products:
Invertor: NVF2G/NVF5

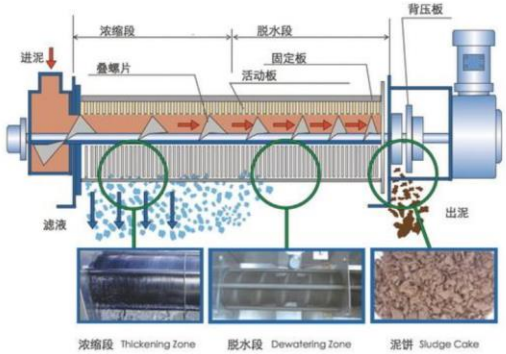
Benefits:
1:Energy saving 30%-60% deepens on situation
2:Achive needed pressure by adjusting speed of pumps.
3:Pumps alternative and soft starting longer life cycle of pipe system.

Sewage Treatment

Process



Applications or Machines



CHINT solutions

A Thickening and Dewatering

Description:
Centrifugal thickening and dewatering of sewage sludge is a high speed process that uses the force from rapid rotation of a cylindrical bowl to separate wastewater solids from liquid.

Challenges:
1:Certain speed difference between 2 motors
2:High maintains cost caused by repair and shorten life cycle.
3:Energy saving.

A Chint solutions

Products:
Invertor: NVF2G/NVF5

Benefits:
1:Precise speed control for separating.
2:Protect mechanic parts of equipment.
3:Energy saving 30%-60% deepens on situation.

Sewage Treatment

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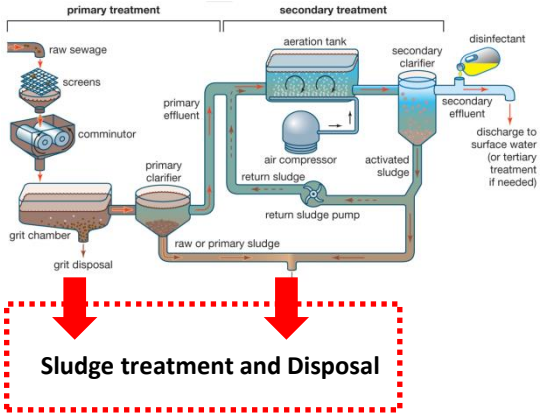
Process



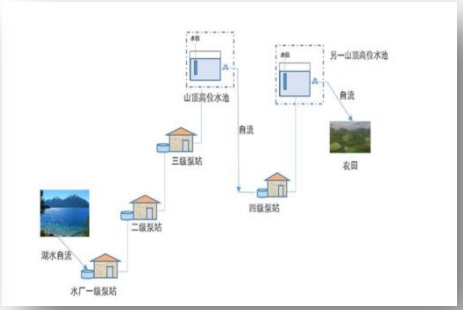
Application or Machine

CHINT solutions

B Conveyer
Description: Transportation of dewatered sludge and other equipment.
Challenges: 1:Avoid lash to mechanic part or power grid. 2:Synchronized speed with other process and saving energy. 3:High maintains cost caused by repair and shorten life cycle.

B Chint solutions
Products: Invertor: NVF2G/NVF5
Benefits: 1:Soft start and soft stop and precise speed control. 2:Energy saving 10%-30% deepens on situation. 3:Protect mechanic parts of equipment.

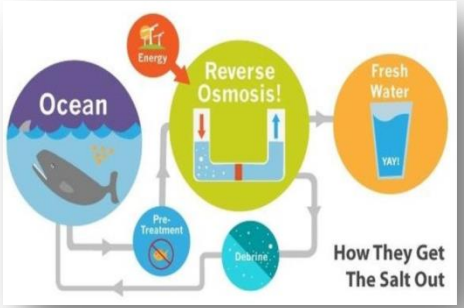
Irrigation system

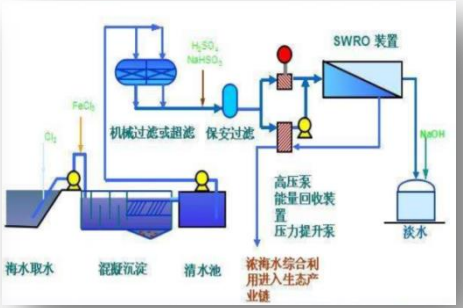


With access to water resources becoming scarce in some regions of the world, efficient and sustainable irrigation is becoming more and more important. It's all about supplying enough water to get maximum crop yield without using more water and energy than absolutely necessary.

CHINT AC drives adapt pressure or flow rate to the actual need. And integrated application software functions help to both protect the pipe system by limiting pressure boost and cut energy consumption.

Seawater Desalination





Seawater covers 71% of the planet surface and represents 97% of the worlds water. Water technologies supports municipalities and industries in the implementation of their seawater desalination strategies.

Desalination can be defined as any process that removes salts from water. Desalination processes may be used in municipal, industrial, or commercial applications. With improvements in technology, desalination processes are becoming cost-competitive with other methods of producing usable water for our growing needs.

CHINT can provide drive products to support all the process of desalination of seawater with high performance and quality.

Success Stories

Customer: One Chinese Pump manufacturer

Typical Application: Pumps

CHINT Products: NVF2G series

Potential: xxxx

Requirements:

- Smoothly changing between pumps
- PID inside; Sleeping Mode;

Customer Benefits:

- Energy saving : 20%-55%
- Protection: reduced the lash to power grid and mechanic parts
- Balance of pressure: especially when changing pumps.
- High productivity: good products quality and work 24H*7D period

Success Stories

Customer: One Mixer manufacturer in Wenzhou

Typical Application: Mixer

CHINT Products: NVF3M series

Potential: xxxx

Requirements:

- High output torque in low frequency.
- High capacity of overload.
- Running in tough environment.

Customer Benefits:

- High performance in mixture function.
- High productivity: good products quality and work 24H*7D period

Success Stories

Customer: One HVAC manufacturer

Typical Application: Blower

CHINT Products: NVF2G series

Potential: xxxx

Requirements:

- RS-485 communication.
- PID function inside.
- High EMC requirement.

Customer Benefits:

- Easy maintenance and protection on mechanical components.
- AC reactor and filter used to achieve high efficiency factor.
- Better performance in temperature control.

Success Stories

Customer: One wastewater equipment manufacturer

Typical Application: Speed control in linear movement.

CHINT Products: NVF5 series

Potential: xxxx

Requirements:

- Precise speed control.
- High output torque in low frequency.
- Running in tough environment.

Customer Benefits:

- High performance in speed control.
- Easy maintenance and protection on mechanical components.
- Coated circuit board insure longer lifecycle in tough environment.

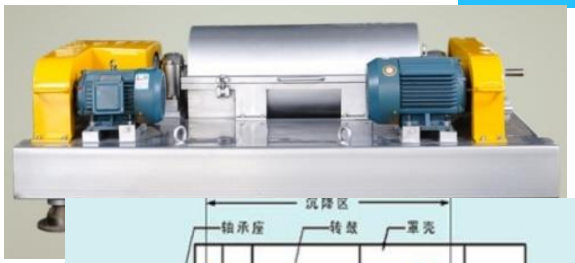
Success Stories

Customer: One centrifuge dewatering equipment manufacturer

Typical Application: Speed control in rotary moving.

CHINT Products: NVF2G series

Potential: xxxx



Requirements:

- Speed synchronous between two drives
- Precise speed control.
- Running in tough environment.

Customer Benefits:

- High performance in speed control.
- Easy maintenance and protection on mechanical components.
- Coated circuit board insure longer lifecycle in tough environment.

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THANKS

THANK YOU FOR WATCHING

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