CHENGDU ROSUN DISINFECTION

DW-1 Product Introduction

Makes The
Rivers And Earth Cleaner
Helps Billions
Of People Be Healthier

1 History of Disinfection

➢ Outbreaks of a series of infectious disease in history because there is no disinfection

- Outbreak of plague (Black Death) in the 14th century ,killing half the Europeans, it repeatedly broke out and didn't stop until the 18th century.
- In 1816, for the first time in human history, cholera pandemic broke out in Bangladesh and India.
- British cholera pandemic in 1831, affecting almost the half of the Eastern Hemisphere.
- Chicago cholera pandemic in 1885,claimed 90,000 lives.
- European Influenza（1917~1919） resulted in 50 million deaths.

➢ Disease have been prevented by disinfection

- SARS
- Bird Flu
- Ebola
- EMS WSDV

Water quality become worse, and water pollution more and more serious

1950s
Wash rice
and vegetables

1960s
Wash cloth and irrigation

1970s
Water quality went bad

Fish begin to die
1980s

Harmful to the human health
1990s

.....
21st century

Such kind of water

Have you used?

Chemical by-product Problem

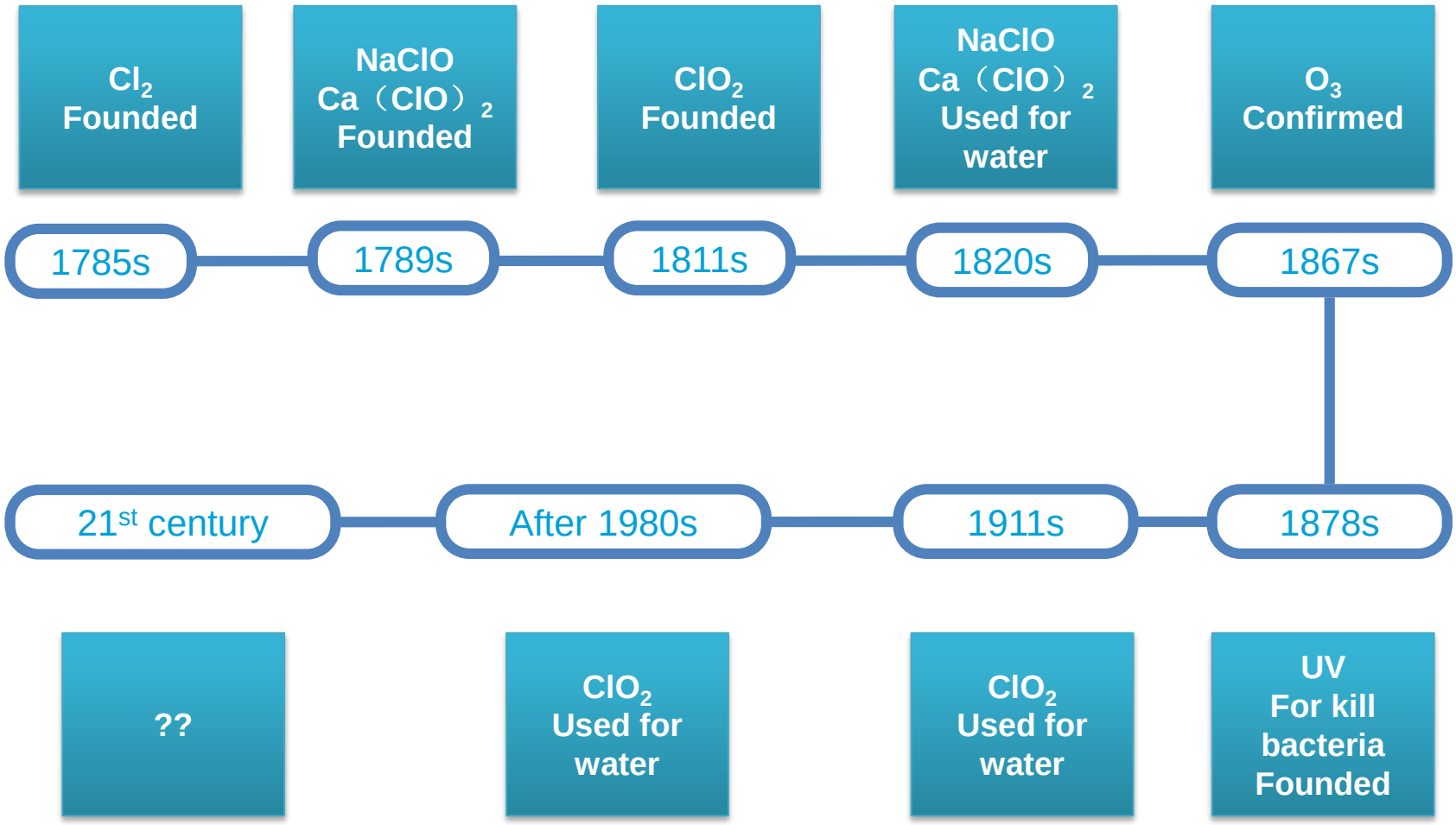
When use disinfectant in bad quality water, it will produce a large amount of chemical by-products when meet the organic matter in water.

- Chlorine and its compound, bromine, iodine: THM ,chlorinated disinfection byproduct, doesn't exist in natural water, and is only produced in chlorinated disinfection process. Currently there are over 500 kinds of chlorine disinfection by-products that have been confirmed.
- HOCl + Br + NOM = THMS + other haloforms
- NOM: Natural organics humic acid and fulvic acid
- THMS: trihalomethanes
- Chlorine dioxide: causing chlorite
- Ozone: bromate is level-2B potential carcionogen, which can be obtained by ozone oxidized into bromine ion, $Br + O_3 \rightarrow BrO_3$

Chemical by-product Problem

- Main chlorine-induced toxic substances confirmed by WHO include:
- 1. Carcinogen:
- THMS, HAAS, halogenated cyanide, haloaldehydes, phenol, etc.
- HAAS: DCAA's carcinogenic risk is 50 times of THMS.
- TCAA: its carcinogenic risk is 100 times of THMS.
- 2. Mutagenicity: typical liver, kidney and bladder mutagenicity of chloroform, bromoform, furaneol, (monobromo-dichloro-methane, dibromo-monochloro-methane)
- 3. Suspected carcinogenic substances: dichloroacetic acid, bromate, formaldehyde

History of Disinfection



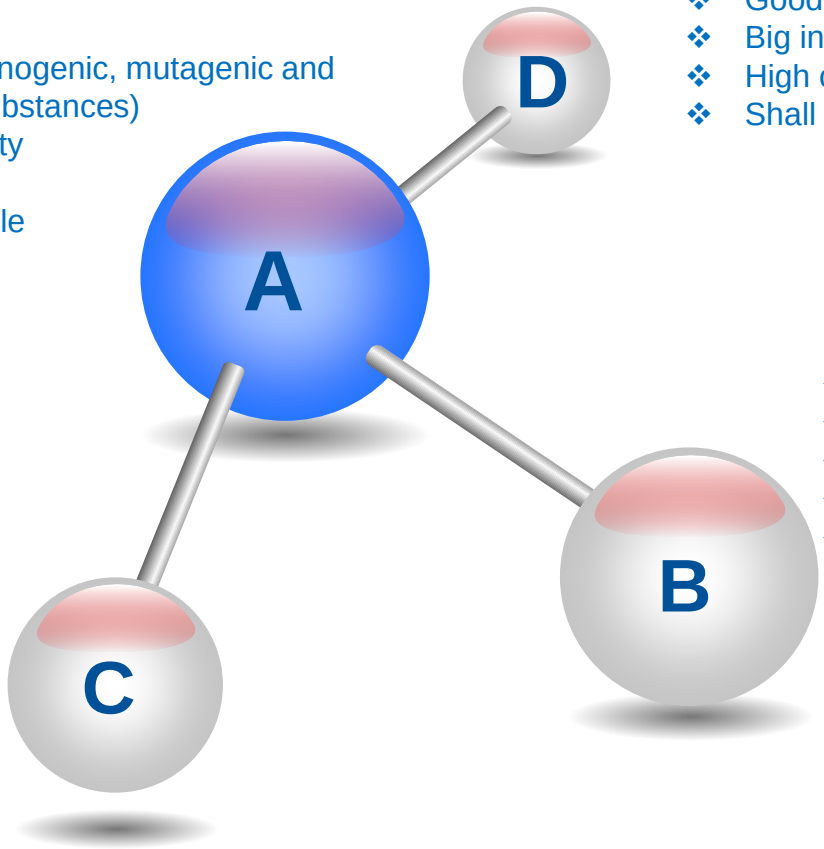
➢ The existing disinfection in the market

A: Chlorine(Liquid Chlorine, Calcium Hypochlorite, Sodium hypochlorite, etc.)

- Low price
- Danger By-products (carcinogenic, mutagenic and suspected carcinogenic substances)
- Store and transport difficulty
- Leakage
- Flammable and combustible

D: Ultraviolet

- Good sterilization effect
- Big influence from floats in water
- High cost
- Shall be frequently changed



B: Chlorine dioxide

- Good effect and long duration
- Difficult to store
- Shall be prepared on site for use
- Expensive cost
- Disinfection by-products produced due to complex test technology

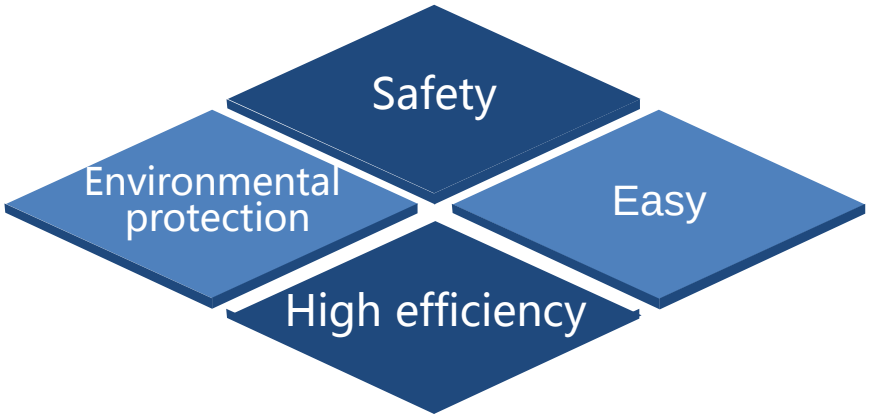
C: Ozone

- Good sterilization effect
- No enduring effect
- Complex preparation
- High cost
- Produce Bromate

What kind of disinfection method the water company calls for?

No accident

Good for people and environment



Easy to use and transport

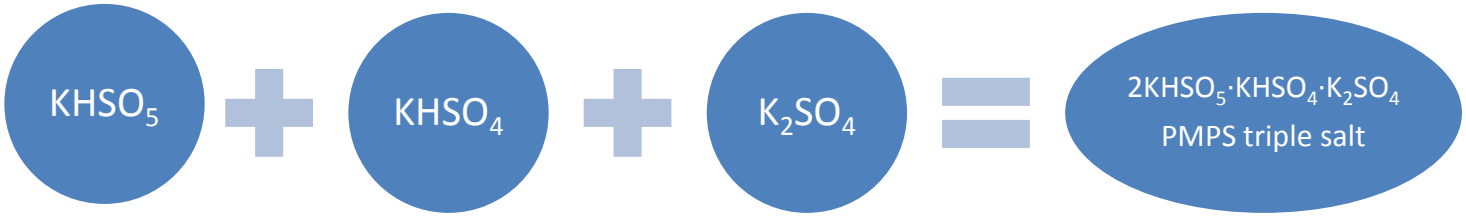
Low dosage can kill microbe

The potassium monopersulfate disinfectant has the advantages shows above.

2 DW-1 product introduction

Potassium monopersulfate triple salt (PMPS)

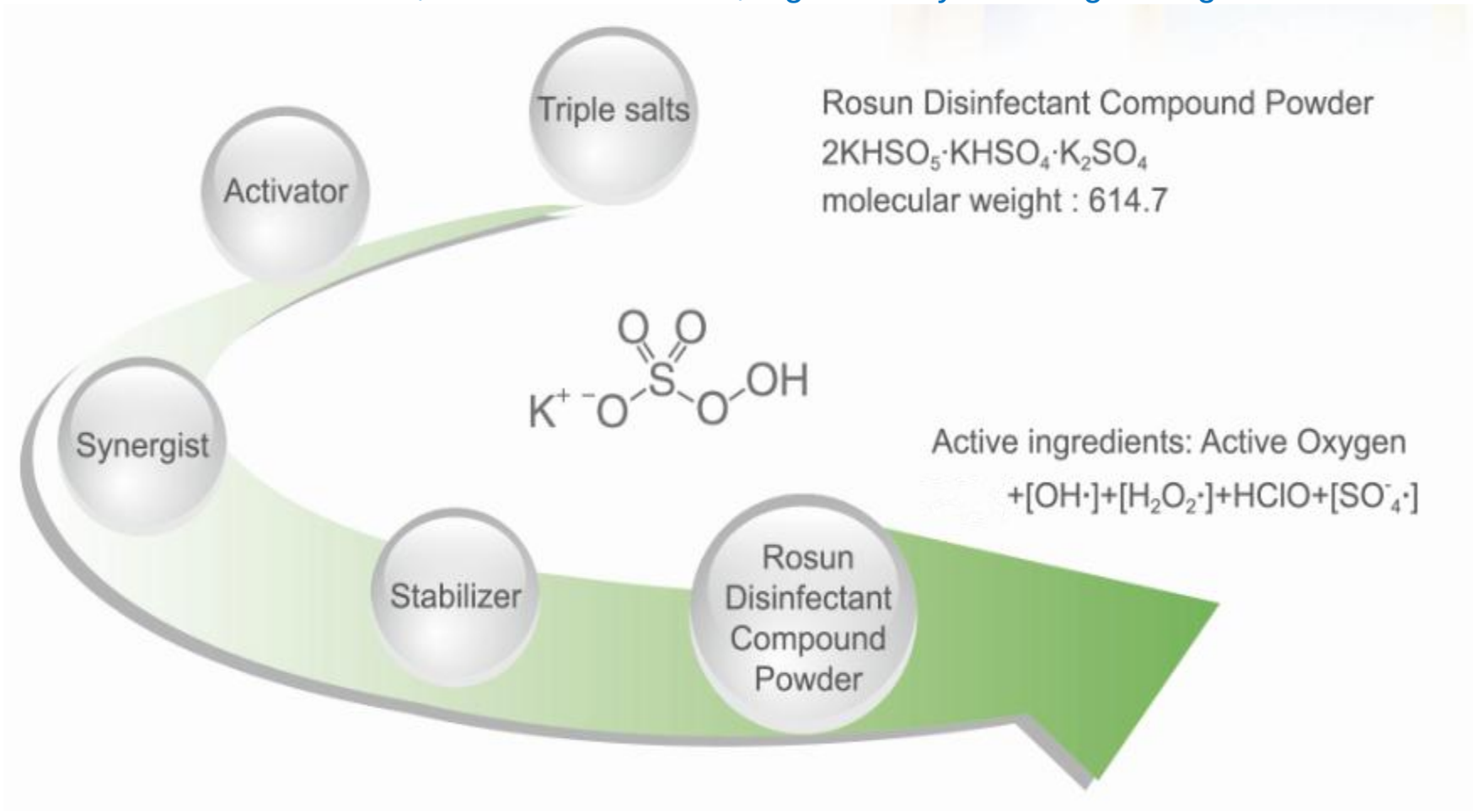
- In the early 1990s, British use PMPS to treat the foot and mouth disease which spread in European countries, and get excellent result, then European countries started the research of PMPS product, and the series product get used in rapidly.
- Then the different countries have promoted the standard for this chemical:
  In 2000, Germany promoted national standard, standard No, DIN EN 12678:2000
  In 2001, France promoted national standard, standard No. NF T94-309-2001
  In 2002, British promoted national standard, standard No. BS EN 12678



- But as PMPS is not stable, when dissolve in water, it will quickly release oxygen and potassium sulfate, no long lasting efficacy, so usually it used as oxidizer or oxygen supply chemical in aquaculture.

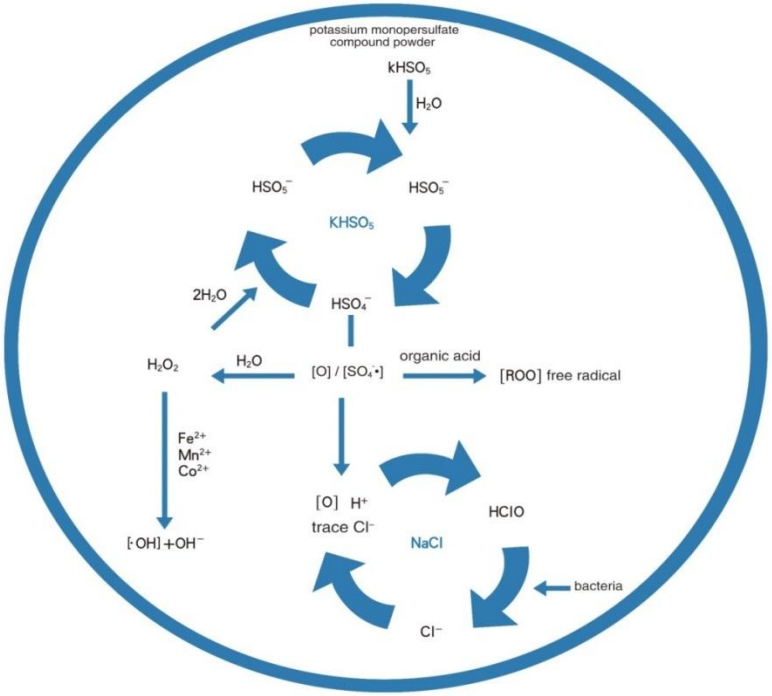
➢ Rosun disinfectant powder DW-1 core mechanism

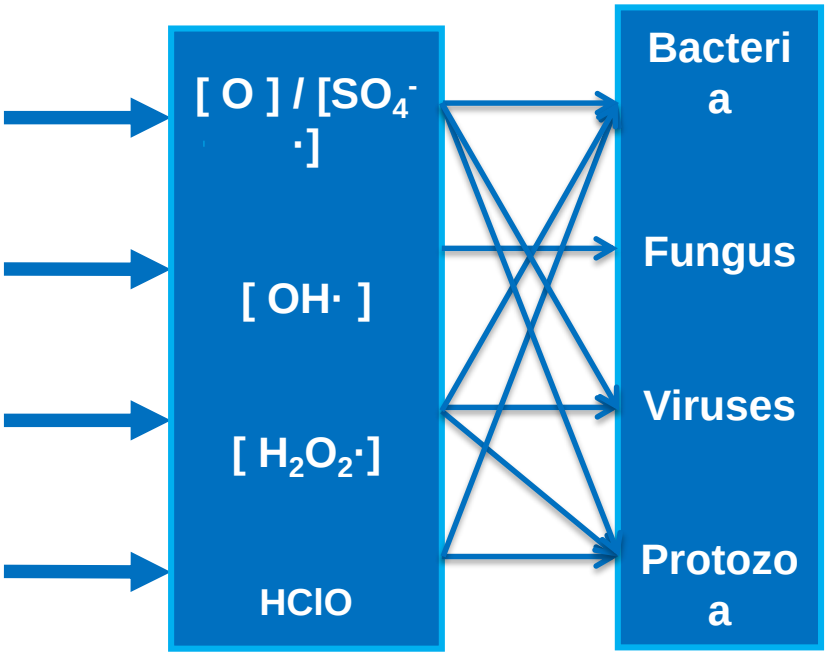
- Rosun use special synergistic activation technology by add activator, synergist, stabilizer inside PMPS, so it is more stable, high efficacy and long lasting.



➢Rosun DW-1--- A new generation disinfection

- Name：Rosun DW-1
- Main components：potassium monopersulfate
- Chemical formula：**$2KHSO_5 \cdot KHSO_4 \cdot K_2SO_4$**
- Physical property：white powder
- Solubility: soluble in water



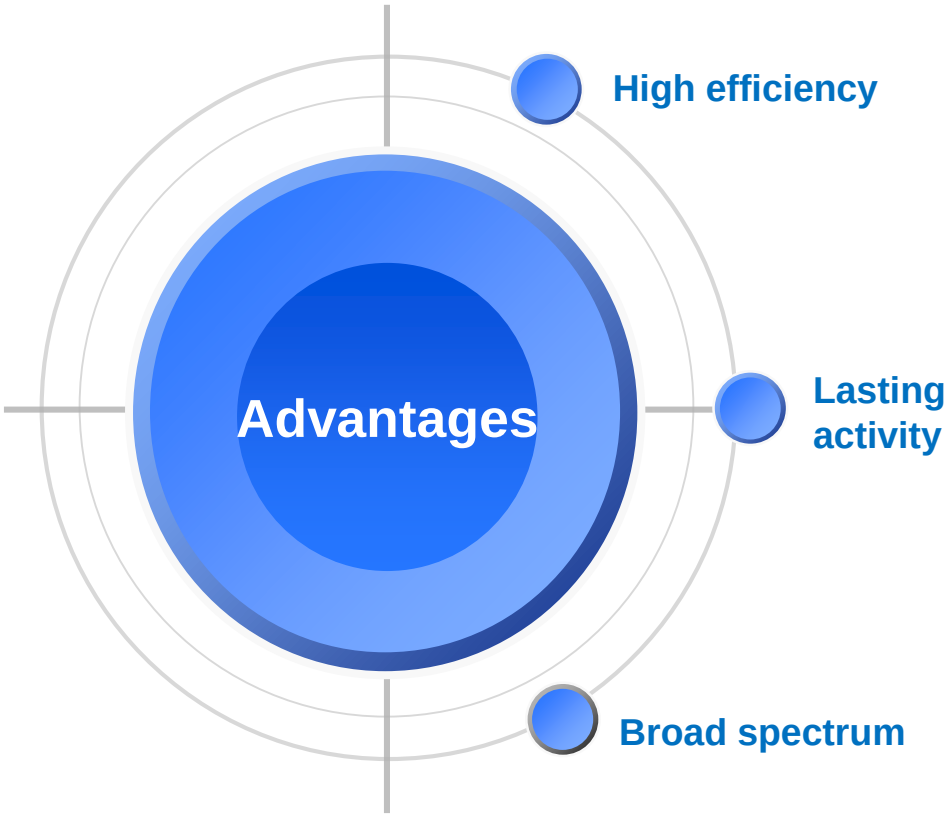


Cycle chain reaction——
long lasting efficacy

Different kinds of active ingredients —— **Broad Spectrum**

Oxidizing Agent	F_2	·OH	SO_4^{-} ·	O_3	O	H_2O_2	ClO_2	HClO	Cl_2
Oxidation Potential	3.06	2.80	2.5-3.1	2.07	1.84	1.77 (pH<7)	1.5	1.48	1.36

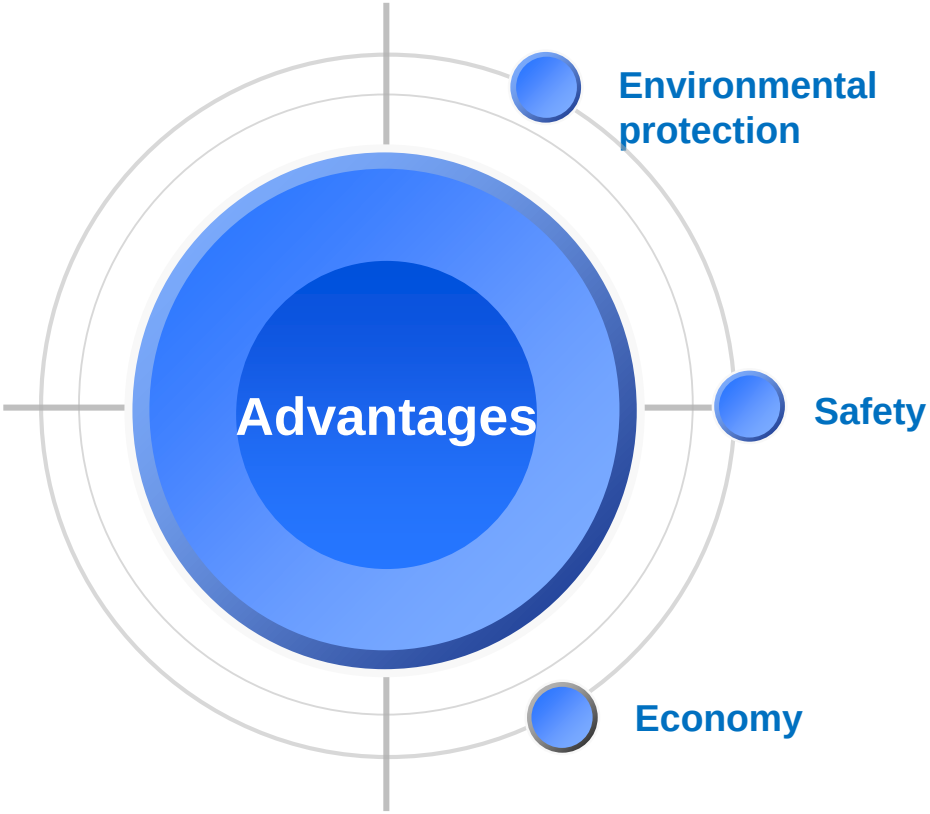
High oxidation Potential——**High efficacy**



- Continuously produce active ingredients, sterilization over 99.9% bacterial.

- Release active ingredients continuously, efficacy last for lone time.

- Many active ingredients make this product have super broad-spectrum sterilization effect, the antibacterial spectrum includes bacteria, viruses, fungi, bacteria spores, protozoa, algae spores,etc.



- Rosun disinfectant powder can reduce and prevent the production of harmful substances that may lead to carcinogenesis, teratogenesis and mutagenesis, such as organic chloride.

- This product is a powder disinfectant, so there is no danger during the production, transportation, storage and application which liquid chlorine caused.

- Lower disinfectant consumption, higher equipment cost-effective, longer service life and low maintenance cost.

3 Authority Certificates

Standard/Guidance

National Health and Family Planning Commission of P.R.C. in January 6, 2014 list potassium monopersulfate salt as a disinfectant for drinking water, and announced through National Hygiene Announcement [2013] No. 11 file (words in Red)

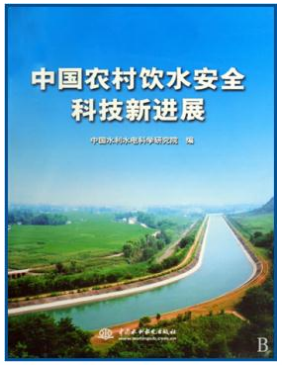
Form4 Main ingredient list of chemical agent		
No.	Main Ingredient Name	Usage
1	Poly dimethyl diallyl ammonium chloride	flocculation
2	polyacrylamide	flocculation
3	aluminium salt	flocculation
4	ferric salt	flocculation
5	calcium hydroxide	coagulation aid、pH adjustment
6	silicate	coagulation aid、anti-scale
7	potassium permanganate	Disinfection、oxidation
8	polyphosphates	Anti-scale
9	Sodium hypochlorite, calcium hypochlorite	coagulation aid、disinfection
10	**Potassium mono-perosulfate salt**	**Disinfection**
11	sodium dichloro isocyanurate，trichloroisocyanuric acid※	Disinfection
12	chlorine dioxide	oxidation 、Disinfection
13	hydrogen peroxide	oxidation 、Disinfection
14	ammonium sulfate	Disinfection
15	Sulfites class	reducing agent
※Only a few used when in emergency		

Standard/Guidance

Extract content:

Potassium monopersulfate (DW-1) Sterilization characteristics

- The concentration of the Active oxygen is 7%-9%. only need 15min to kill most microorganism in water.
- Cycled chain reaction in water, continuous release Active oxygen and other Free Radical, so the Sterilization effect can last for long time in water.
- Different active ingredients coexist together, which lead to broad spectrum
- The killing effect is hardly influenced.
- Not produce harmful residue, only little K^+, SO_4 contribution.



Disinfection License of Product Involving Drinking Water Safety

四川省涉及饮用水卫生安全产品
卫生许可批件

产品名称：水王子牌单过硫酸氢钾饮用水消毒粉
产品类别：化学处理剂-消毒剂
产品规格或型号：粉剂
产品技术信息：
【产品说明】
【主要成份或部件】单过硫酸氢钾复盐
【使用范围】
【注意事项】

申请单位：成都润兴消毒药业有限公司
申请单位地址：成都高新区桂溪工业园
实际生产企业：成都润兴消毒药业有限公司
实际生产企业地址：成都市经济技术开发区车城东五路139号
审批结论
经审核，该产品符合《生活饮用水卫生监督管理办法》的有关规定，现予批准。
批准文号 （川）卫水字（2007）第016号
批准日期 2011年4月2日
批件有效期截至 2015年4月1日
发证单位：
2011年 月 日

Product approval

证书

成都润兴消毒药业有限公司：
经评定，你单位"单过硫酸氢钾饮用水消毒粉"项目列为二〇一二年全国建设行业科技成果推广项目。

证书

成都润兴消毒药业有限公司：
经评定，你单位"单过硫酸氢钾饮用水消毒粉"项目列为二〇〇八年全国建设行业科技成果推广项目。

Award of High and new Technology Product

NSF Certification

NSF International
789 N. Dixboro Road, Ann Arbor, MI 48105 USA

RECOGNIZES

Chengdu Rosun Disinfection Pharmaceutical Co., Ltd.
Facility: Sichuan Province, China

AS COMPLYING WITH NSF/ANSI 60 AND ALL APPLICABLE REQUIREMENTS.
PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE
AUTHORIZED TO BEAR THE NSF MARK.

NSF

ANSI

This certificate is the property of NSF International and must be returned upon request. This certificate remains valid as long as this client has products in Listing for the referenced standards. For the most current and complete Listing information, please access NSF's website (www.nsf.org).

May 27, 2015
Certificate# C0233149 - 61

David Purkiss
General Manager, Water Systems

NSF certificate

NSF International
789 N. Dixboro Rd. Ann Arbor, MI 48105, USA
1-800.NSF.MARK | +1.734.769.8010 | www.nsf.org

TEST REPORT

Send To: C0233149
Ms. Monica Ye
Chengdu Rosun Disinfection Pharmaceutical Co.,Ltd.
No.139,East 5th Rd.Of Auto Centre)
Eco&Tech Development Zone,
Chengdu City Sichuan Province
610100
China

Facility: C0233149
Chengdu Rosun Disinfection Pharmaceutical Co.,Ltd.
No.139,East 5th Rd.Of Auto Centre)
Eco&Tech Development Zone,
Chengdu City Sichuan Province
China

Result	**PASS**	Report Date	27-APR-2015
Customer Name	Chengdu Rosun Disinfection Pharmaceutical Co.,Ltd.		
Tested To	NSF/ANSI 60		
Description	Rosun Disinfectant Powder | Solid		
Trade Designation	Rosun Disinfectant Powder		
Test Type	Qualification		
Job Number	J-00172615		
Project Number	W0158864		
Project Manager	Jiali Hu		

This report documents the testing of the referenced product to the requirements of NSF/ANSI Standard 60 (Drinking Water Treatment Chemicals - Health Effects). This standard establishes minimum requirements for chemicals, the chemical contaminants, and impurities that are added to drinking water from drinking water treatment chemicals. Contaminants produced as by-products through reaction of the treatment chemical with a constituent of the drinking water are not covered by this Standard. Reference the "About the Standard" section at the end of this report for additional information about NSF/ANSI Standard 60 and the products covered under this Standard.

Thank you for having your product tested by NSF International.

Please contact your Project Manager if you have any questions or concerns pertaining to this report.

Report Authorization Amanda Phelka - Director, Toxicology Services **Date** 27-APR-2015

FORM0427152119 J-00172615 Page 1 of 6

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NSF test report

Reach Test Report

SGS

Test Report No. NGBHG1404330301 Date: 22 Dec 2014 Page 1 of 13

(SVHC)

CHENGDU ROSUN DISINFECTION PHARMACEUTICAL CO.,LTD
NO.139EAST FIFTH RD,OF AUTO CENTRE, ECO&TECH DEVELOPMENT ZONE OF CHENGDU CITY, CHINA, 610100

The following sample(s) was/were submitted and identified on behalf of the clients as : ROSUN DISINFECTANT POWDER DW-1 FOR DRINKING WATER

SGS Job No. :	NBHG1412005244SD - NB
Date of Sample Received :	16 Dec 2014
Testing Period :	16 Dec 2014 - 22 Dec 2014
Test Requested :	As requested by client, SVHC screening is performed according to: (i) One hundred and fifty five (155) substances in the Candidate List of Substances of Very High Concern (SVHC) for authorization published by European Chemicals Agency (ECHA) on and before Jun 16, 2014 regarding Regulation (EC) No 1907/2006 concerning the REACH.
Test Results :	Please refer to next page(s).

Summary :

According to the specified scope and analytical techniques, concentrations of tested SVHC are ≤ 0.1% (w/w) in the submitted sample.	PASS

Signed for and on behalf of
SGS-CSTC Ltd.

Iris Xiao
Approved Signatory

SGS 检测专用章 Testing Service
SGS-CSTC Standards Technical Services Co., Ltd. Ningbo Branch
1-2,5F West No. 4 Building, Lingyue Industry Park, No.1177 Lingyue Road, Ningbo National Hi-Tech Zone, Ningbo, China 315040 t E&E (86-574) 89070224 f E&E (86-574)87782095 www.sgsgroup.com.cn
中国·宁波·国家高新区凌云路1177号凌云产业园4号楼西1-2,5层 邮编: 315040 t HL (86-574) 89070209 f HL (86-574)87768122 e sgs.china@sgs.com
Member of the SGS Group (SGS SA)

➢ China test results (Drinking Water test experiment)

1 Test of sterilization active ingredients

Average active oxygen content of the batch No. 20060928 sample is 8.41% (m/m).

2 Disinfection Effect Test For Drinking Water treatment

The distilled water adding standard bacteria, then add product to 0.25mg/L concentration, disinfection for 15, 30, 45 minutes, at each time point were not detected escherichia coli. According to the results, the water disinfection with the product correspond to escherichia coli index of Ministry of Health *Drinking Water Health Standards* (*2001)*requires.

3 Dose Assessment

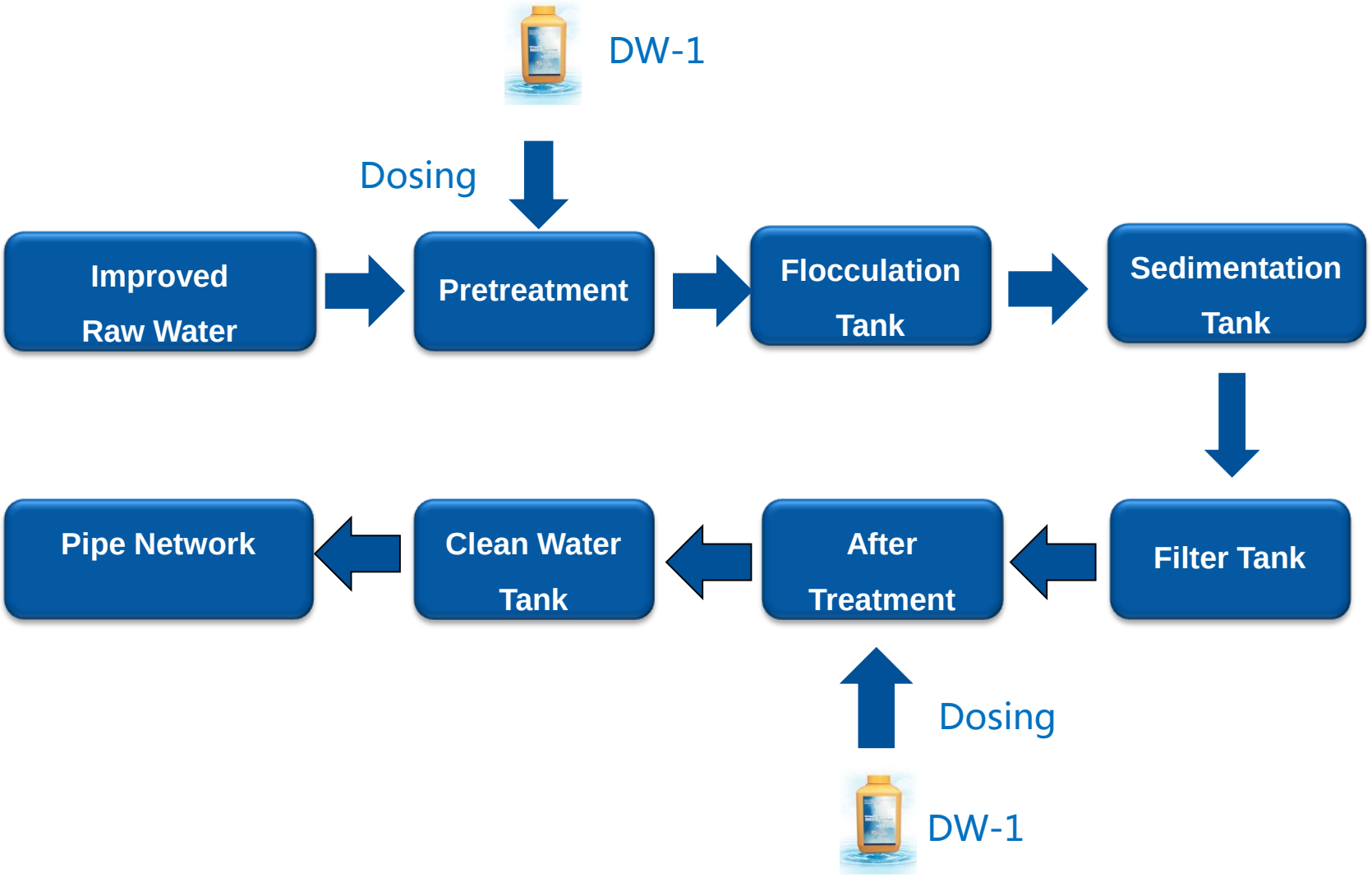
The solution of 25mg/L product, the arsenic content is 0.0021mg/L, plumbum content is 0.0013mg/L, chrome content is 0.0025mg/L, cadmium content is 0.00095mg/L, silver content is 0.0011mg/L, and mercury content is 0.00017mg/L. All the content corresponds to Ministry of Health *Drinking Water Health Standards* (*2001)* requires.

4 Overall Performance Test

The raw water add 5mg/L product, after disinfection for 30min, all the test items correspond to Ministry of Health *Drinking Water Health Standards* (*2001)* requires.

4 Application and Facilities

➢DW-1 process flow

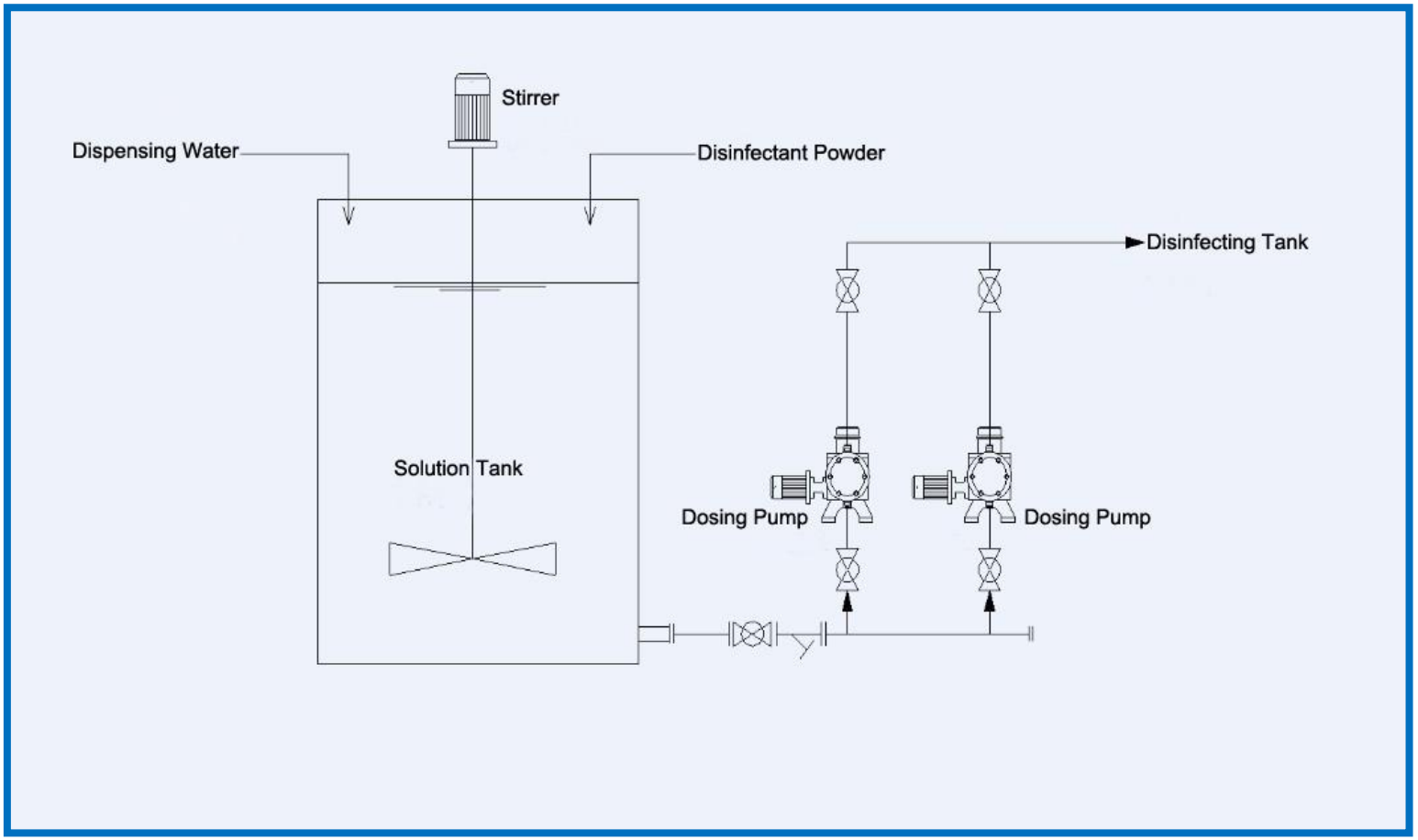


➢Dosing equipment

Optimized type

High-end type

Equipment Principle



The equipment principle is quite simple, can refit the recent dosing equipment or build a simple dosing system.

➢Active Ingredient Tester

1. Take a certain amount of sample water by colorimetric cylinder, add 1 pack of test kit, shake up to make it dissolve completely.

2. Wipe off the water and fingerprint on the colorimetric cylinder, after the bubble gone, compare the color with the card.

The active ingredient tester can show the bacteria situation in water indirectly, it is very easy to bring and use.

5 Achievements in China

➢ Rosun disinfectant powder DW-1

- Application area : Drinking Water Disinfection
- Achievement :

1.Number of total waterworks: app.10000

2.Number of waterworks that use Rosun DW-1: app.600

3.The biggest handling capacity of waterwork :200,000 m^3

Disinfection Object	Guide dosage	Contact Time	Instructions for use
City and Rural Area Tap water plant	0.3-1g/m^3	20-30min	Dissolve to 1%~2% solution by plastic drum, then add the solution in the water that need to treat by dosing pump continuously.
City Recycled water supply	1-1.5g/m^3	15-20min	
Bottled Water	0.2~0.5g/m^3	20-30min	
Emergency Water Disinfection (such as disaster area)	2-10g/m^3	20-30min	Add the powder in the water that need to treat, stir evenly and place for 30min before drink.

➢ Application Example(DW-1)

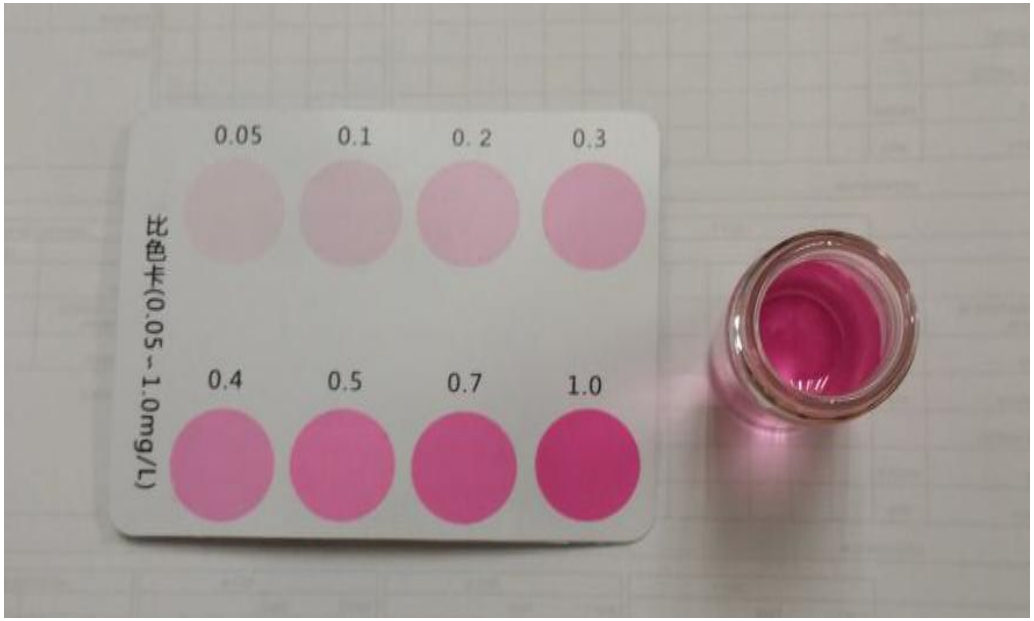
Plant Name	Plant Scale (m^3)	Dosage (g/m^3)	Remark
Shandong Qingdao City Jimo Water Plant	80000	0.5	Pretreatment
Shandong Binzhou City East Sea Water Company	30000	0.4	After Treatment
Shandong Qingdao City Chengyang Water-Xiazhuang Waterworks	20000	0.7	Pre and After Treatment
Shandong Anqiu Hua'an Water Cooperation	8000	0.8	Pre and After Treatment
Anhui Huizhou District Water Plant	30000	0.5	After Treatment
Anhui Shexian Water Plant	30000	0.5	After Treatment
Anhui Yixian Water Plant	10000	0.25	After Treatment
Shanxi Hancheng Water Plant	20000	0.3	After Treatment
Shanxi Heyang Shendu Water Plant	10000	0.3	After Treatment
Fujian Unit 731146 Water Plant	8000	0.5	After Treatment

6 Study Case in Malaysia

➢Case Study 1 (Trusan Water Treatment Plant) 21st- 23rd September 2016

- Designed water treatment capacity: 20000m^3/day;
- Actual water treatment capacity: 23000m^3/day;
- Average flow rate: 960m^3/h
- Dosing equipment situation: Two 200gallon chemical dissolving tank. used by gravity flow dosing
- Dosage DW- 1: 1ppm as additive with Calcium hypo 1ppm

- Result:



Free chlorine of finish water at WTP: 1ppm

- Result:

Free chlorine at terminal water 30km away from WTP: 0.55ppm

Free chlorine at terminal water more than 50km away from WTP: 0.23 ppm

Comparison between Calcium Hypochlorite and Rosun DW-1

Calcium Hypochlorite Solution

Rosun DW-1 Solution

Terminal water (SK. Kpg Sebrang) In- Situ testing and water sampling for bacteria test by Ministry of Health Officer

PEJABAT KESIHATAN DAERAH LAWAS,
LOT 534, JALAN PENGIRAN HAJI MATUSIN,
98850 LAWAS.
SARAWAK.

Tel : 085-282234
Faks : 085-284807
Email : kmam_lawas@srwk.moh.gov.my

Ruj. Tuan :
Ruj. Kami : PKDLWS/KMAM/A7(32)
Tarikh : 29.09.2016

Jurutera Daerah,
Jabatan Bekalan Air Luar Bandar (JBALB),
98850 Lawas.

Tuan,

Makluman Keputusan Sampel Air Terawat semasa percubaan rawatan penggunaan ROSUN dalam air rawatan di LRA Trusan Regional.

Perkara tersebut diatas adalah dirujuk.

Untuk makluman pihak tuan/puan, bagi keputusan ujian mikrob dalam air terawat yang dilaksanakan bersama JRH Corporation dan diselia oleh pihak JBALB. Ada 4 point sampling yang diambil untuk ujian mikrob. Sampel tersebut diambil dan dihantar ke Jabatan Kimia Malaysia, Sabah dan juga ada dianalisa di Pejabat Kesihatan Daerah Lawas Makmal KMAM Lawas.

Keputusan ujian adalah seperti berikut;

Tarikh	Masa	Tempat	*T. Coliform*	*E. Coli*	Baki Klorin	Catatan
22/09/2016	8.50 am	Market Lawas	0	0	0.55	Bacaan Jab. Kimia
22/09/2016	10.17 am	SK Kpg Seberang	TNTC	0	0.38	Bacaan Jab. Kimia
22/09/2016	2.30 pm	Market Lawas	0	0	0.55	KMAM Lawas
22/09/2016	3.10 pm	SK Kpg Seberang	200.5mpn/ 100ml	50.4mpn/100ml	0.20	KMAM Lawas
22/09/2016	4.05 pm	SMK Sundar	0	0	0.30	KMAM Lawas
23/09/2016	2.30 pm	Market Lawas	0	0	0.10	KMAM Lawas
23/09/2016	3.10 pm	SK Punang	3.1mpn/ 100ml	0	0.03	KMAM Lawas
23/09/2016	4.05 pm	SK Kpg Seberang	0	0	0.11	KMAM Lawas

Nota: Warna gelap adalah melanggar.

Sekian terima kasih,

"Penyayang, Profesionalisme dan Bekerja Berpasukan Adalah Budaya Kerja Kita"

Saya yang menurut perintah,

(DR. AZRINE BIN AZIZ)
Pegawai Kesihatan Daerah,
Pejabat Kesihatan Daerah Lawas.

[illegible]

- Comment:

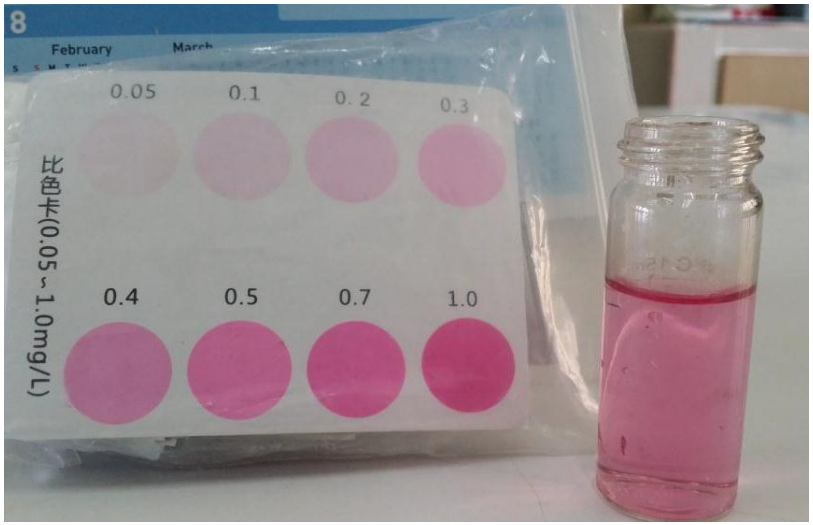
- Proven reduction of bacteria (T. Coliform & E. Coli) at SK. Kpg Sebrang. It was located more than 50 Km away from WTP with 1 water resevoir before supply to SK. Kpg Sebrang.

- Other terminal water at market lawas and SMK Sundar which located within 30Km are totally free from bacteria after apply Rosun DW-1.

Case Study 2 (Felda Sahabat Loji C) 5 January – 9 January 2017

- Designed water treatment capacity: 20000m^3/day;
- Actual water treatment capacity: 14400m^3/day;
- Average flow rate: 600m^3/h
- Dosing equipment situation: One 200 Liter chemical dissolving tank. used by gravity flow dosing.
- Dosage DW- 1: 1ppm as additive with Calcium hypo 0.7ppm

Rosun DW-1 Dosing by gravity flow on clarified water tank



In- Situ Free Chlorine at Loji C finish water: 1ppm

In- Situ Free Chlorine at SK. Fajar Harapan Terminal water 20 Km away: 0.2ppm

Finish water at Loji C is collected and send to accredited laboratory to perform bacteria test.

With Loji C personnel and Ministry of Health Officer

BP Food & Environmental Testing

Lab No	: BBR00174-175/0117E	Date Of Testing	: 06.01.2017
Company Name	: NATIONCHEM SDN BHD	Date Of Report	: 13.01.2017
Company Address	: LOT 19, 1ST FLOOR, BLOCK C BUNDUSAN SQUARE, PENAMPANG JALAN BUNDUSAN 88300 PENAMPANG, SABAH		
Reference No	: -	Sample No	: BBR174-175
Type Of Sample	: WATER	Date Received	: 06.01.2017
Date Of Sampling	: 05.01.2017	Date Of Request	: 06.01.2017

CERTIFICATE OF ANALYSIS

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Sample Location : LOJI C (FINAL WATER)

Test Parameter	Unit	Before Dosing Rosun	After Dosing Rosun	Test Method
		BBR174	BBR175	
Free Residual Chlorine	mg/L	<0.1	<0.1	In House Method EWI-WC11
Total Coliform	MPN/100mL	2.8×10^3	ND(<1.1)	APHA 9221 B
Escherichia coli	MPN/100mL	ND(<1.1)	ND(<1.1)	APHA 9221 F

Remark : (1) APHA : Standard Methods for the Examination of Water & Wastewater, 21st Edition (2005)

BP Food & Environmental Testing

Lab No	: BBR00393/0117E	Date Of Testing	: 11.01.2017
Company Name	: NATIONCHEM SDN BHD	Date Of Report	: 19.01.2017
Company Address	: LOT 19, 1ST FLOOR, BLOCK C BUNDUSAN SQUARE, PENAMPANG JALAN BUNDUSAN 88300 PENAMPANG, SABAH		
Reference No	: -	Sample No	: BBR393
Type Of Sample	: WATER	Date Received	: 11.01.2017
Date Of Sampling	: 09.01.2017	Date Of Request	: 11.01.2017

CERTIFICATE OF ANALYSIS

Sample Location : LOJI C (FINAL WATER)

Test Parameter	Unit	Loji C	Test Method
		BBR393	
Free Residual Chlorine	mg/L	<0.1	In House Method EWI-WC11
Total Coliform	MPN/100mL	ND(<1.1)	APHA 9221 B
Escherichia coli	MPN/100mL	ND(<1.1)	APHA 9221 F

Remark : (1) APHA : Standard Methods for the Examination of Water & Wastewater, 21st Edition (2005)
(2) ND : Not Detected

Thank you

Chengdu Rosun Disinfection Pharmaceutical Co., Ltd

Makes The Rivers And Earth Cleaner , Helps Billions Of People Be Healthier

ROSUN Disinfection Specialist