NHK SPRING (THAILAND) Co., Ltd

Wellgrow Industrial Estate

Non Chemical Catalytic Scale Prevention

Induction Coil – A Report

Colloid -A- Tron 100

Prepared By

NBA INTERTRADE Co., Ltd

5/47 Soi Anamai , Srinakarin Rd.,

Kwang Suanlaung , Bangkok 10250

Tel : 02 - 183-6193-4 ; Fax : ext - 102

E-mail : nbaintertrade@gmail.com

www.nbainter.com

www.treatwater.com

Date : March 5 , 2010

Introduction

NBA Intertrade Co.Ltd., is accredited Distributor in Thailand by the Fluid Dynamic International Ltd. This company is a UK based with over 35 years experience manufacturing and very successful in Non- Chemical water treatment solution around the world.

Colloid-A-Tron is leading scale prevention and also dissolved & previously deposited scale can be cleared over a period of time which have range designed for use in Industrial and Commercial applications catering for equipments protection and environmental friendly.

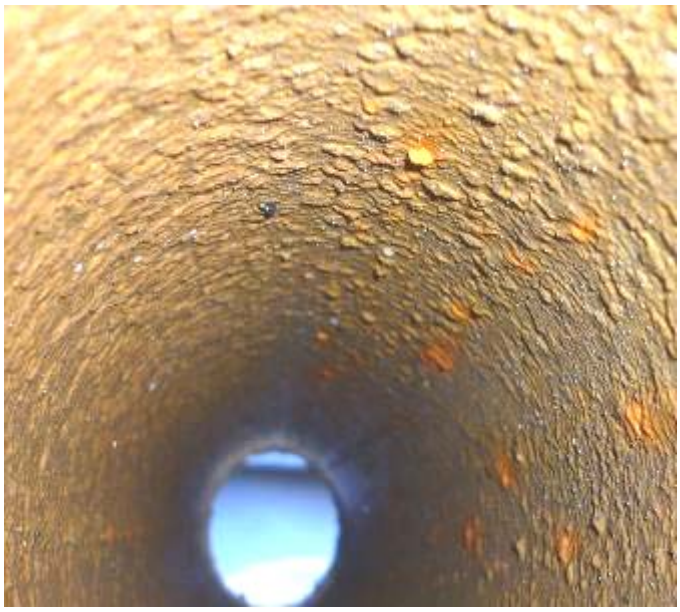
Innovative - Technologies

Colloid-A-Tron (CAT) is an equipment for non-chemical water treatment system. It is operating effectively in preventing hard scale build-up in several thousand heat exchanger plant around the world. The scale formation is controlled by the electron dynamic equilibrium of photon. This technical has provided clear , scientific evidence that the system has a significant effect on scale formation conditions in hard water.

The combination of field experience and basic scientific programs is generating more confidence in preventing scale " Physically " rather than using chemical water-treatment systems.

$$CaCo_3 . CaSO_4 . SiO_2 . MgCO_3 . Al_2O_3 . Fe_2O_3 + 9e^- \longrightarrow$$

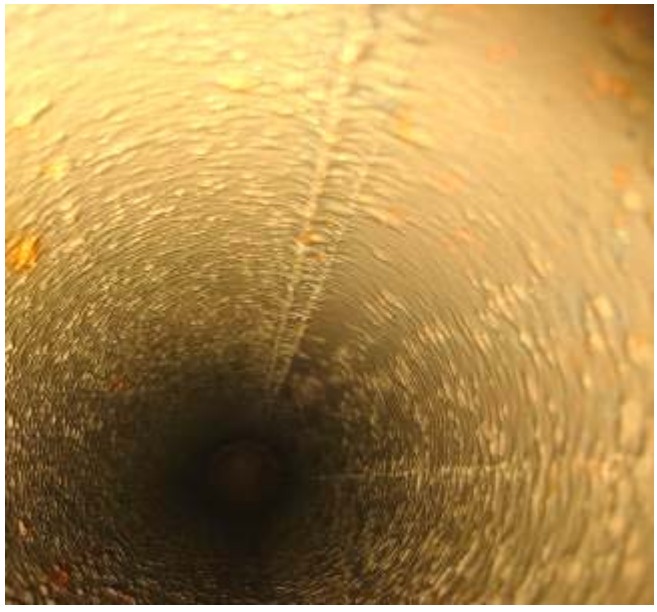
$$2Ca^{\circ} + Mg^{\circ} + 2CO_3^{2-} + SO_4^{2-} + SiO_2^{-} + Al_2O_3^{-} + Fe_2O3^{-}$$



Before : 26 – 12 – 09

Picture of scale inside pipe before installed CAT-100

Thickness 2.00 - 3.00 mm..



After : 27 – 02 - 10

Picture of scale inside pipe after installed CAT -100

Thickness 1.2 – 1.5 mm..

Town office : 5 /47 Soi Anamai , Srinakarin Rd ., Kwang Suanlaung , Bangkok 10250
Tel : 02-183-6193 - 4 Fax : ext. 102 E - mail : nbaintertrade@gmail.com , **www. nbainter. com**

Objective

Colloid-A-Tron (CAT-100) has been installing at Water Cooling System Area-2 which will be preventing a scale operates as a catalytic using the pH rise generated by alloy to trigger precipitation of scale in the bulk of water in the form of stable aragonite crystals. An existing scaling is also dissolved and previously deposited scale can be removed over a period of time.

The factors of scaling into the water system are :

- Temperature
- Flow velocity
- Pressure
- Area cross section of flow
- pH
- Impurity

Localization of trial installation

NHK SPRING (THAILAND)

Wellgrow Industrial Estate

Cooling System Area-2	:	Induction Coil-A
Date of installation	:	December 26 , 2009
Product CAT-100	:	Flange-ANSI or BS10 or JIS / KIS
		Flow range 45 – 80 M3 / Hr.
		Bursting pressure 7900 psi

Trial Operation Procedure

1. Inspected flow rate of water in Induction Coil-A and Water Chemical Analysis
2. Simulation model will be calculated this trial programs
3. Try to keep a data collection **Before** & **After** for benefits of engineering added value

Pictures and working steps installed CAT-100 at Induction Coil-A

A : 24 - 12 - 2009

A-1 Survey an area to install Flow Meter

A-2 Flow Meter was operated by Siemens

A-3 Flow Meter installed on the cool water inlet

A- 4 Data collection of the flow rate within 1 Hr.

A-5 Flow rate of cool water was 20.5 M3 / Hr and / or Flow velocity was 1.25 m / sec.

A-6 Flow rate of hot water outlet couldn't detection because of water was flowed by spot flow

Town Office : 3747 Soi Ananda , Srinakarin Rd ., Kwang Suanlaung , Bangkok 10250
Tel : 02-183-6193 - 4 Fax : ext. 102 E - mail : nbaintertrade@gmail.com , **www. nbainter. com**

B : 26 - 12 - 2009

B-1 Location at CAT-100 installation

B-2 Water pump 22 Kw , 30 HP , pipe diameter is 4 inches. The water flow rate is 45 M3 / Hr. or Flow velocity is 1.54 m/ sec.

B-3 Reconfirm every things before cut the pipe

B- 4 The pipe was cut above the pump 2.00 meters

B-5 Install CAT-100 with flange-ANSI and having bursting pressure 7,900 psi

Town office : 5 /47 Soi Anamai , Srinakarin Rd ., Kwang Suanlaung , Bangkok 10250
Tel : 02-183-6193 - 4 Fax : ext. 102 E - mail : nbaintertrade@gmail.com , **www. nbainter. com**

C : 27 - 2 - 2010

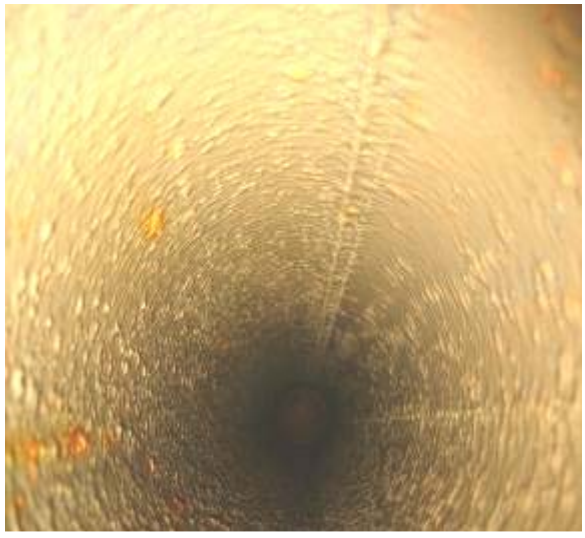
C-1 Cool water analysis at Area-2

pH = 6.74 , Temperature = 32.1oC

Conductivity = 36.1 µscm

C-2 Removed CAT-100 **after installed 60 days**

C-3 Take a pictures record at the Upper part



C-4 Deposit scale are dissolved over 50% at a period 60 days

C-5 Take a pictures record at the Lower part

C-6 Scaling texture are still remaining same as the 60 days ago.

Town office : 5 /47 Soi Anamai , Srinakarin Rd ., Kwang Suanlaung , Bangkok 10250
Tel : 02-183-6193 - 4 Fax : ext. 102 E - mail : nbaintertrade@gmail.com , **www. nbainter. com**

Water Treatment Analyzer

Further to an above data of analyzer , cool water have been proofing a good qualities however there are having a deposit scaling inside pipe and heat exchanger. The mechanism of these factors are

- Gravitational Setting
- Particle transport

The fouling resistance can be calculating as following :

$$R_f = \frac{1}{U_f} - \frac{1}{U_i}$$

Then U_f = Overall heat Transfer coefficient from heat exchanger before cleaning

U_i = Overall heat Transfer coefficient from heat exchanger after cleaning

And $U = \frac{Q}{A \triangle T_{lm}}$

$\triangle T_{lm}$ = different between Log – mean – temperature

$$= \frac{(T_{h,i} - T_{C,O}) - (T_{h,O} - T_{C,i})}{\ln\left[\frac{(T_{h,i} - T_{C,O})}{(T_{h,O} - T_{C,i})}\right]}$$

Town office : 5 /47 Soi Anamai , Srinakarin Rd ., Kwang Suanlaung , Bangkok 10250
Tel : 02-183-6193 - 4 Fax : ext. 102 E - mail : nbaintertrade@gmail.com , **www. nbainter. com**

Remark : h and c = hot water and cool water , o and I = outlet and inlet flow

$$Q = [\, mc_P (T_i - T_O) \,]_h = [\, mc_P (T_O - T_i) \,]_C$$

Remark

Q = Heat Transfer rate

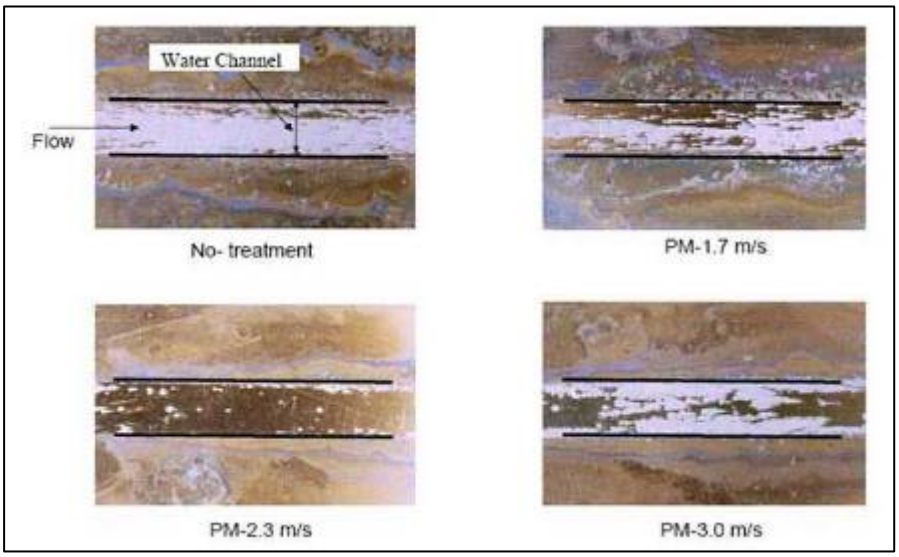
m = Mass Flow rate

Cp = Specific Heat of water

That its mean , the heat exchanger will be improving an efficiency that should be increasing a flow

Due to experimental , an effectiveness of descaling are having a flow velocity at 2.30 m / sec.

Rate of de-scaling are depend on a time and flow velocity in the heat exchanger process



Due to Cooling System Area-2 , the flow velocity are 1.52 m / sec. and Induction coil-A are 1.247 m / sec.

The soft scale will be removed by increase the water flow velocity or prolong a period of time.

Effectiveness

1. Flow Velocity should be attended at 2.3 m / sec.
2. Cycle of concentration on the cooling water system is 5.56 cycles
3. Using filtration system together with Colloid-A-Tron (PWT)
4. Existing scaling is dissolved and previously deposited scale can be cleared over a period of time.

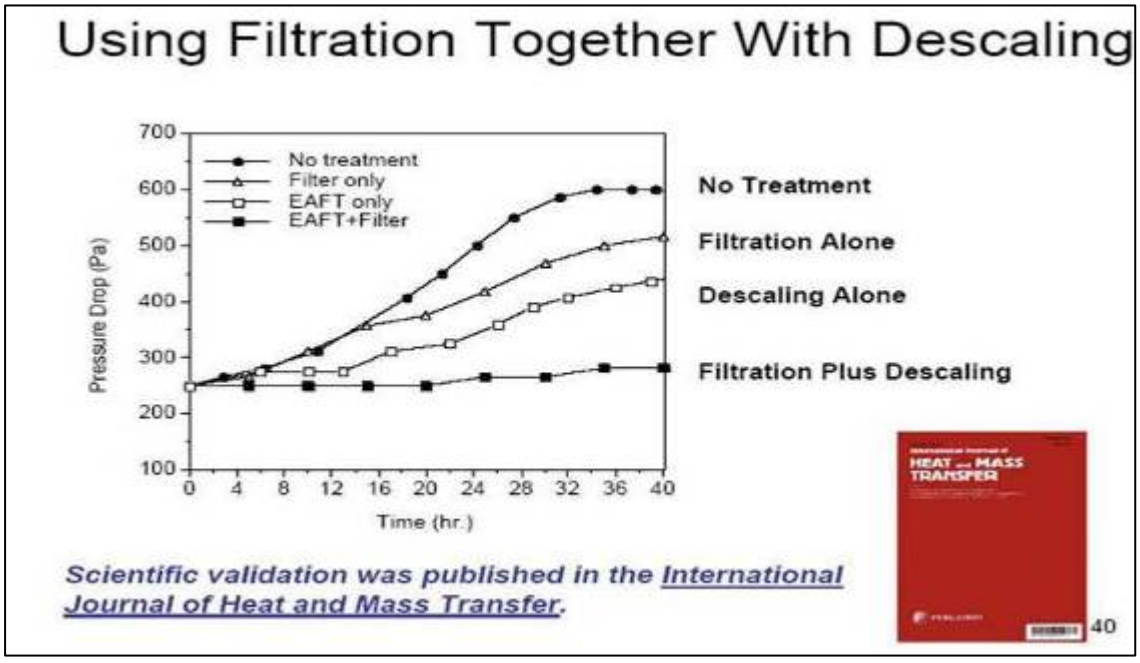
Conclusion

Water is a very good solvent for minerals and many other materials it comes into contact with. Natural water are essentially " ionic soups " all of the ionic species are trying to keep in thermodynamic equilibrium with their environmental , and they achieves this by combining together in clusters – perhaps growing to form crystals – or by breaking up into the free ions. All these reactions are occurring under a given condition such as temperature , pressure , pH , time , flow velocity , mechanical motions , radiation and impurities. Mechanical motions include shaking , mixing , and friction , which can be characterized as turbulence.

When the water is heated inside heat transfer equipments , the ionic soups precipitate due to changes in solubility , forming hard or soft scale on heat-transfer surfaces and clogging heat exchanger pipes and manifolds. The costs of scaling in the heat exchanger system are the prime reason of

- Increase in energy
- Maintenance
- Operation cost

Colloid-A-Tron is a mechanism of the Physical Water Treatment (PWT) devices for the mitigation of mineral fouling in the heat exchanger. It is known that the electro dynamic fields affect the characteristics for the nucleation of mineral ions and other electrically charged sub-micron particles. Thus , it is hypothesized that the water treated by PWT devices tends to produce soft sludge coating on the heat transfer surface. Subsequently , when the shear force generated by the flow velocity in the heat transfer equipment is sufficiently large to remove the soft sludge coating , then the PWT device can prevent new scale deposit or significantly mitigate the scale.



APPENDIX

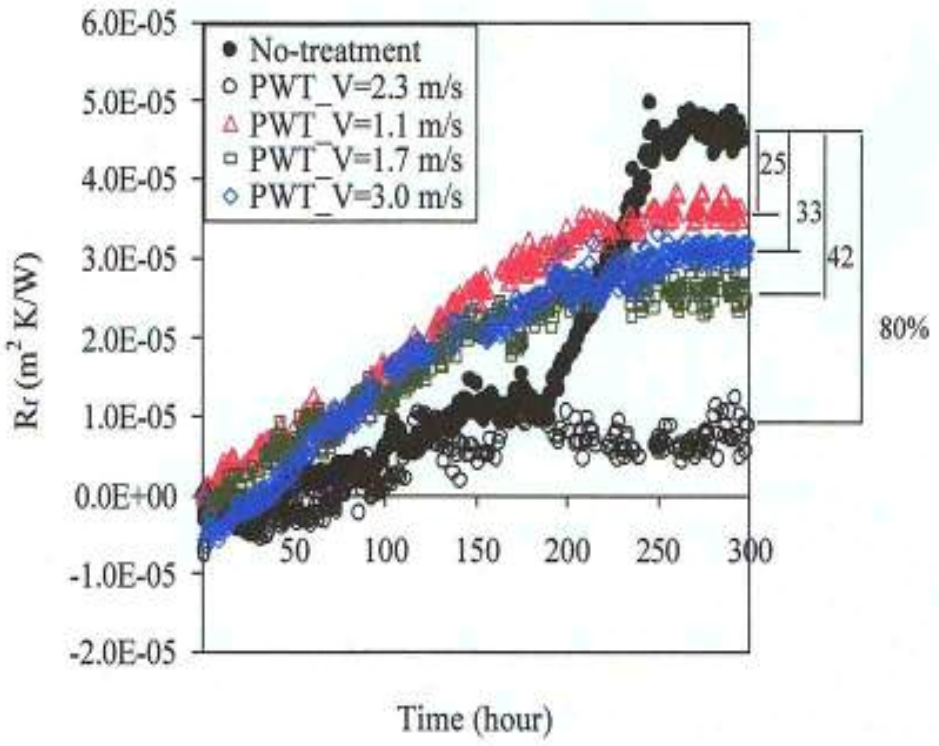


Fig.1 Variations of fouling resistance vs. time for four different flow velocity cases through PWT

Town office : 5 /47 Soi Anamai , Srinakarin Rd ., Kwang Suanlaung , Bangkok 10250
Tel : 02-183-6193 - 4 Fax : ext. 102 E - mail : nbaintertrade@gmail.com , **www. nbainter. com**

Fig. 2a

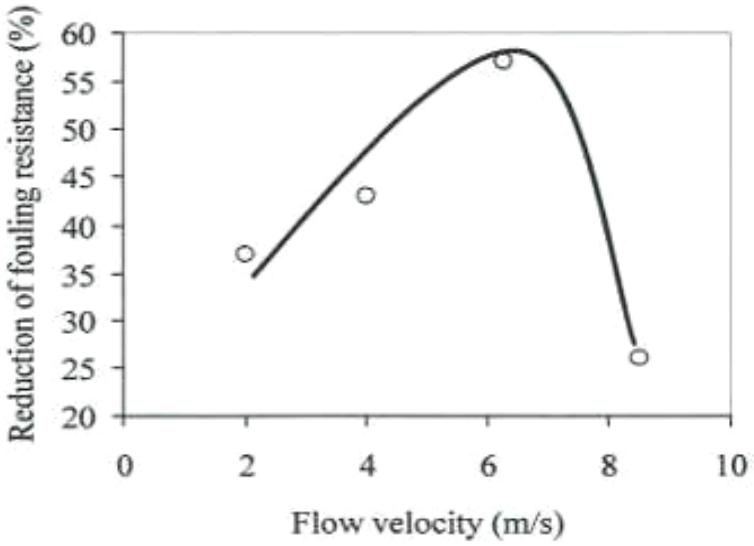


Fig. 2b

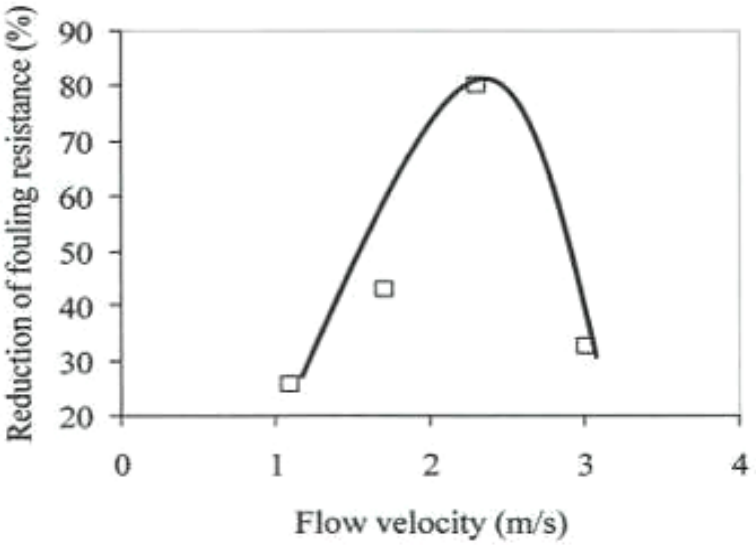


Figure.2 (a) Performance of PWT over a range of flow velocity , and (b) Performance of PWT over a range of flow velocity

Town office : 5 /47 Soi Anamai , Srinakarin Rd ., Kwang Suanlaung , Bangkok 10250
Tel : 02-183-6193 - 4 Fax : ext. 102 E - mail : nbaintertrade@gmail.com , **www. nbainter. com**

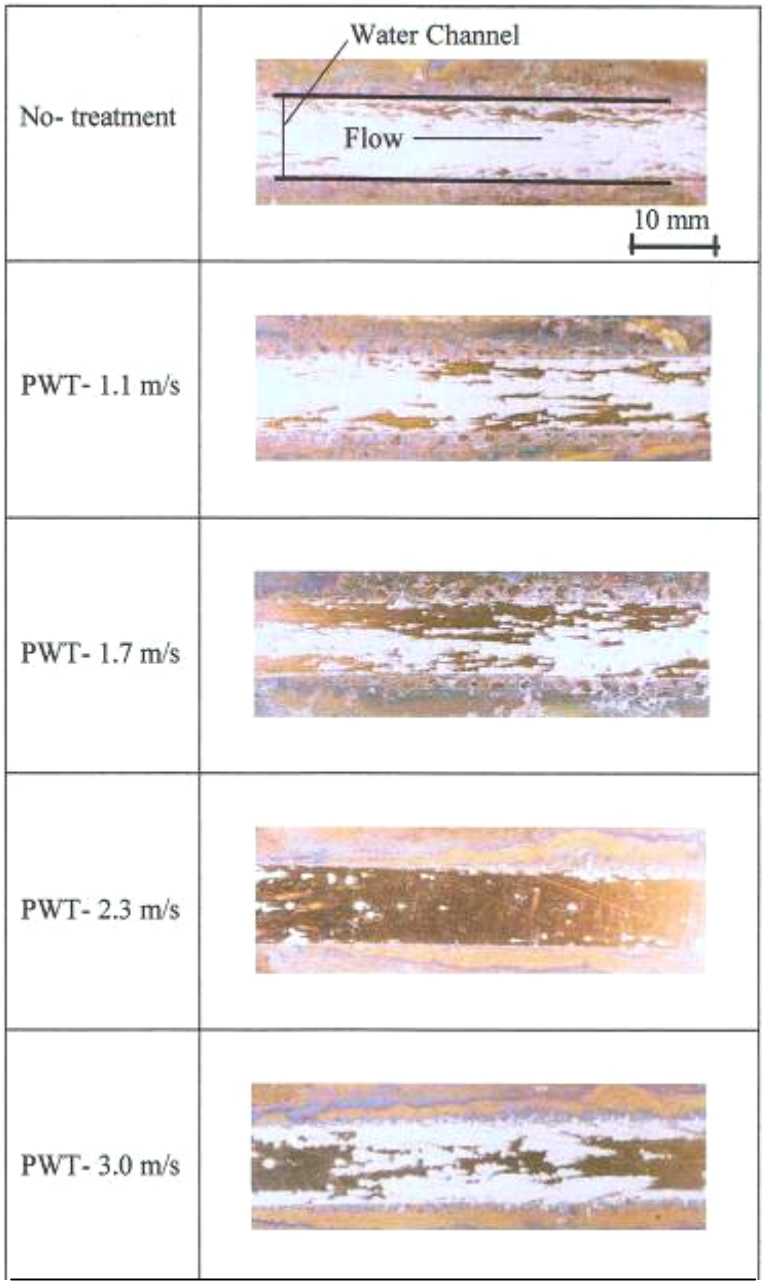


Fig.3 Photographs of fouled surfaces taken after the fouled heat-Transfer surfaces were completely dried

Velocity Effect with PWT - 16

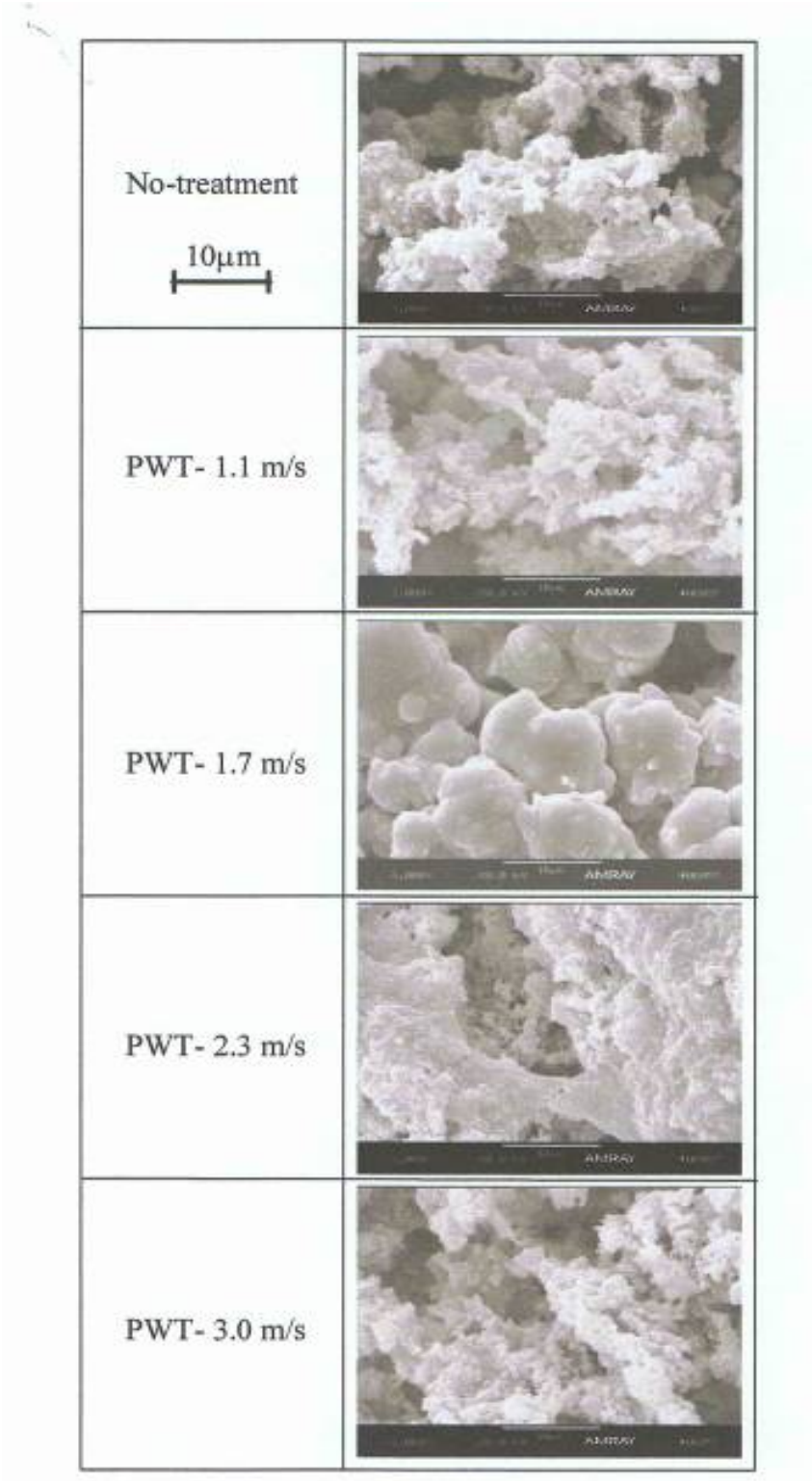


Fig. 4 SEM photographs for all cases , 3000X
Velocity Effect with PWT - 17

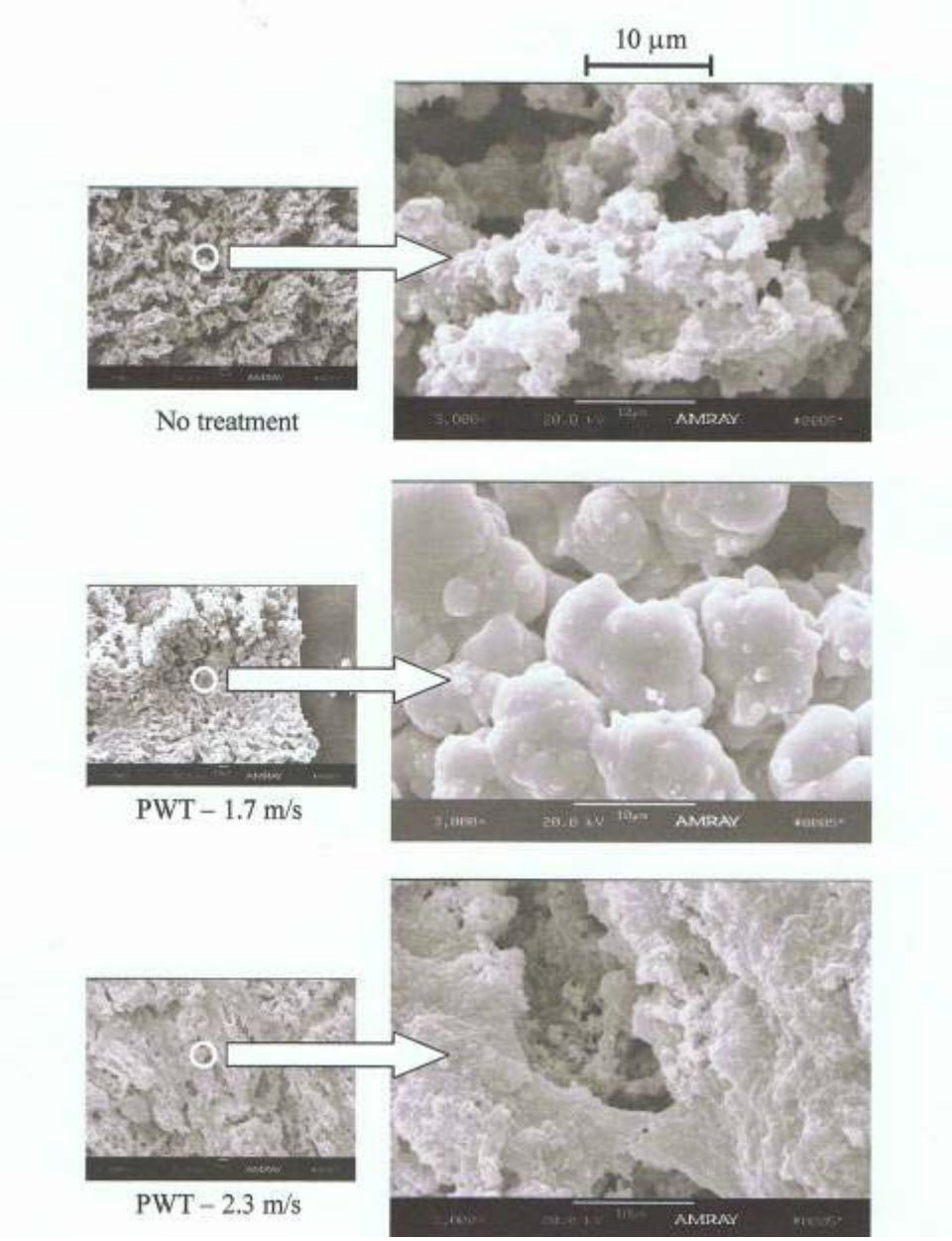


Fig. 5 SEM photographs for cases of no treatment, PWT – 1.7 and 2.3 m/s, 3000X

Velocity Effect with PWT - 18

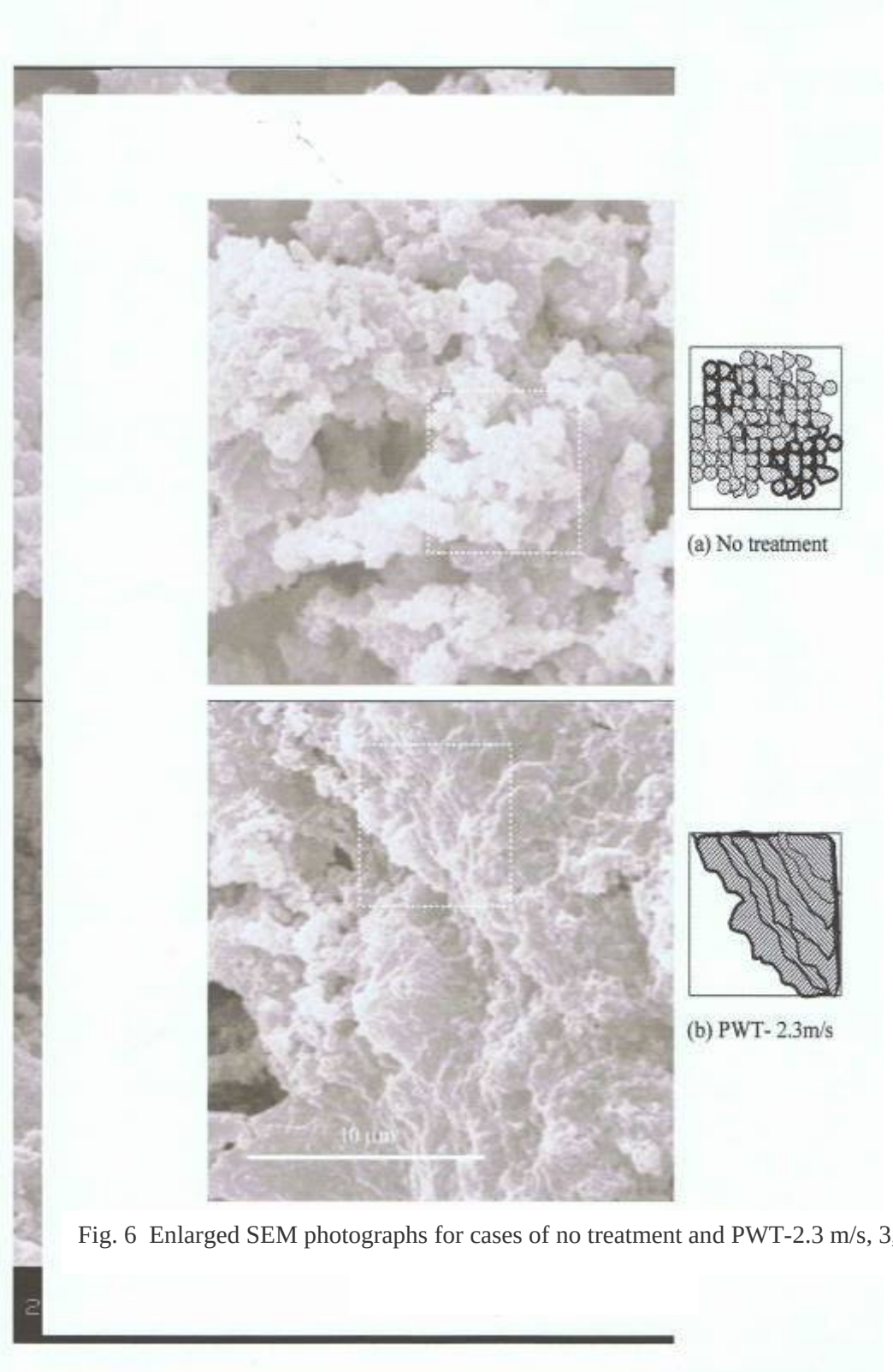


Fig. 6 Enlarged SEM photographs for cases of no treatment and PWT-2.3 m/s, 3,000X

FLOW MASTER (THAILAND) CO., LTD.
159 soi Rama IX 57/1(wisetsookz),suanluang
Suangluang,Bangkok 10250 Thailand.
Tel. 0-23745744-6,Fax 0-23745737
Santi@flowmaster.co.th

FLOWMASTER

Master Solution Provided

Calibration Report

PD-FO-009

Site data				Master Meter Data		Meter Under Test Data	
Station name	NHK	Pipe Nm/OD	DN 80	Manufacturer	SIEMENS	Manufacturer	
Instrument Name	Outlet Water	Pipe Material	Steel	Model	1010WPTR-T1GZ	Model	
Instrument Code	PD-FO-009	Lining Material	No lining	Trans S/N.	U20383	Part No.	
Report No.	SJ 0912004	Pressure	1.5 bar	Cert. No.	L0907-224	S/N.	
Date	24-ธ.ค.-2009	Temp/Humidity	32.00	Date Issued	29 Jul 09	Meter factor	

Item	Time	Master meter data				Meter under test data				Error Results	
		Velocity	Flow(m3/hr)	Totalizer(m3)	I	Velocity	Flow(l/hr)	Totalizer(l)	I	Diff. (l)	% Error
1	11.00	1425.78	0.00	0.00							
2	11.05	1425.86	20.33	1.30							
3	11.10	1424.71	19.97	2.89							
4	11.15	1425.82	20.06	4.55							
5	11.20	1426.03	20.47	6.23							
6	11.25	1426.15	20.45	7.93							
7	11.30	1426.24	20.24	9.63							
8	11.35	1426.83	20.63	11.34							
9	11.40	1427.34	20.35	13.04							
10	11.45	1427.35	20.73	14.76							
11	11.50	1427.73	20.42	16.49							
12	11.55	1427.79	20.41	18.20							
13	12.00	1428.20	20.93	19.93							
		Avg. Flow	**35.00**	Total	**19.9**	Avg. Flow	**0.00**	Total			**0.0%**

	TESTED BY		WITNESS BY	
COMPANY	FLOWMASTER(THAILAND)CO.,LTD		Thai sun	
SIGNATURE				
NAME	Mr. Santi Jitngamkham	Mr. Metha Silsiriwanich		
DATE	25-ธ.ค.-09	25-ธ.ค.-09		

Town office : 5/47 Soi Anamai , Srinakarin Rd., Kwang Suanlaung , Bangkok 10250
Tel : 02-183-6193 - 4 Fax : ext. 102 E - mail : nbaintertrade@gmail.com , **www. nbainter. com**

FLOWMASTER
Master Solution Provided

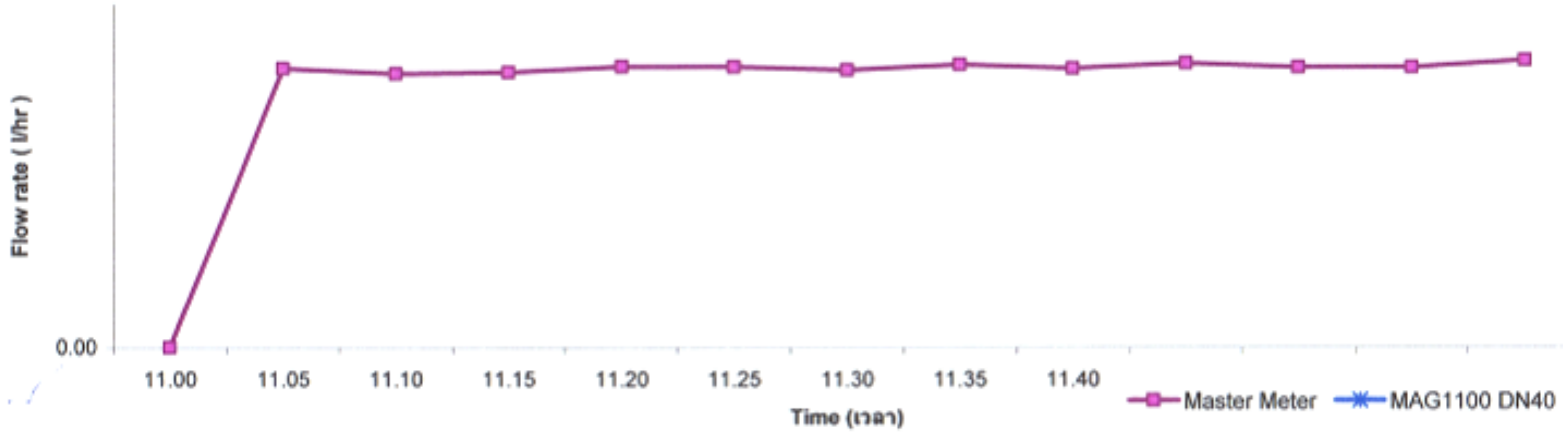
Calibration Report

PD-FO-010

FLOW MASTER (THAILAND) CO., LTD.
159 soi Rama IX 57/1(wisetsoakz),suanluang
Suangluang,Bangkok 10250 Thailand.
Tel. 0-23745744-6,Fax 0-23745737
Santi@flowmaster.co.th

Site data				Master Meter Data		Meter Under Test Data	
Station name	NHK	Pipe Nm/OD	DN 80	Manufacturer	SIEMENS	Manufacturer	
Instrument Name	Outlet Water	Pipe Material	Steel	Model	1010WPTR-T1GZ	Model	
Instrument Code	PD-FO-009	Lining Material	No lining	Trans S/N.	U20383	Part No.	
Report No.	SJ 0912004	Pressure	1.5 bar	Cert. No.	L0907-224	S/N.	
Date	24-ธ.ค.-2009	Temp/Humidity	32.00	Date Issued	29 Jul 09	Meter factor	

Calibration Chart



	TESTED BY		WITNESS BY	
COMPANY	FLOWMASTER(THAILAND)CO..LTD		Thai sun	
SIGNATURE				
NAME	Mr. Santi Jitngamkham	Mr. Metha Silsiriwanich		
DATE	25-ธ.ค.-09	25-ธ.ค.-09		

Town office : 5/47 Soi Anamai , Srinakarin Rd., Kwang Suanlaung , Bangkok 10250
Tel : 02-183-6193 - 4 Fax : ext. 102 E - mail : nbaintertrade@gmail.com , **www. nbainter. com**