

NHK SPRING (THAILAND) Co., Ltd

Wellgrow Industrial Estate

Non Chemical Catalytic Scale Prevention Induction Coil – A Report

Colloid -A- Tron 100



Prepared By

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Introduction

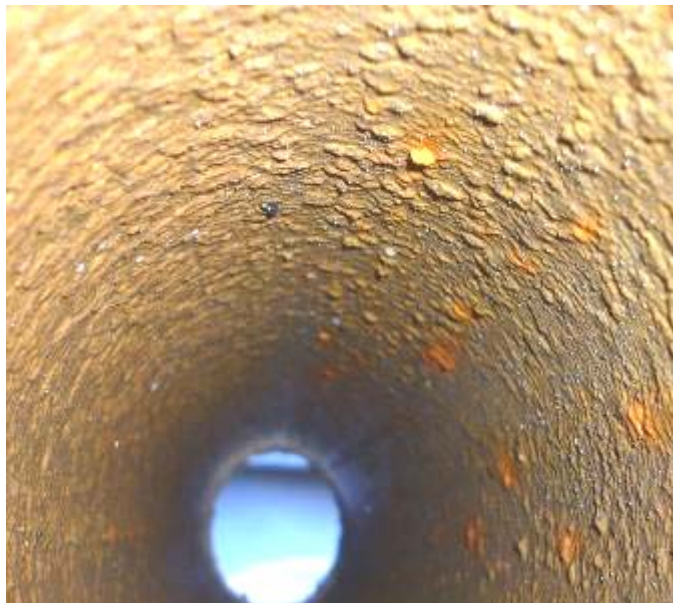
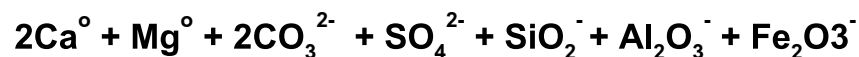
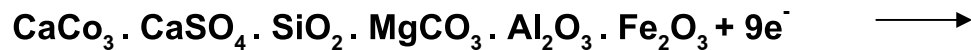
NBA Intertrade Co.Ltd., is accredited Distributor in Thailand by the Fluid Dynamic International Ltd. This company is a UK based with over 35 years experience manufacturing and very successful in Non- Chemical water treatment solution around the world.

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.

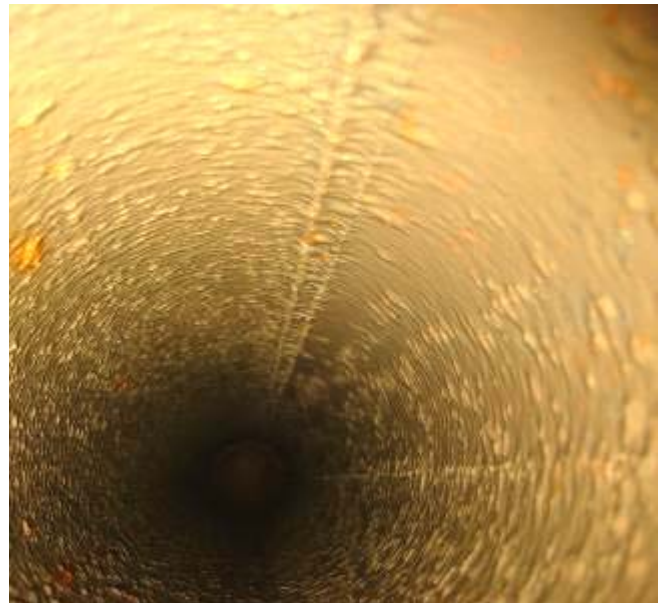
The combination of field experience and basic scientific programs is generating more confidence in preventing scale “ Physically ” rather than using chemical water-treatment systems.



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..

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

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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



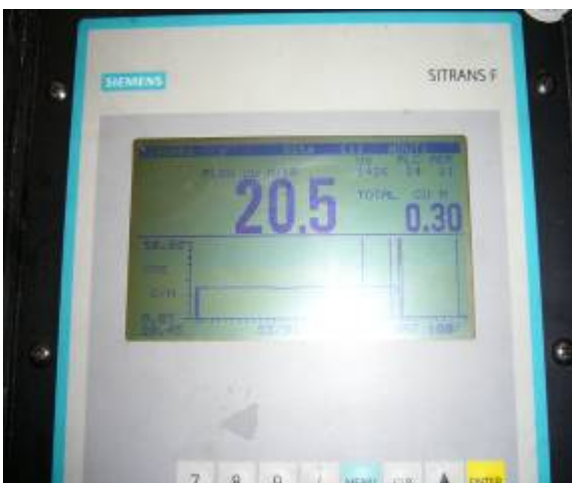
A-2 Flow Meter was operated by Siemens



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

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

C : 27 - 2 - 2010



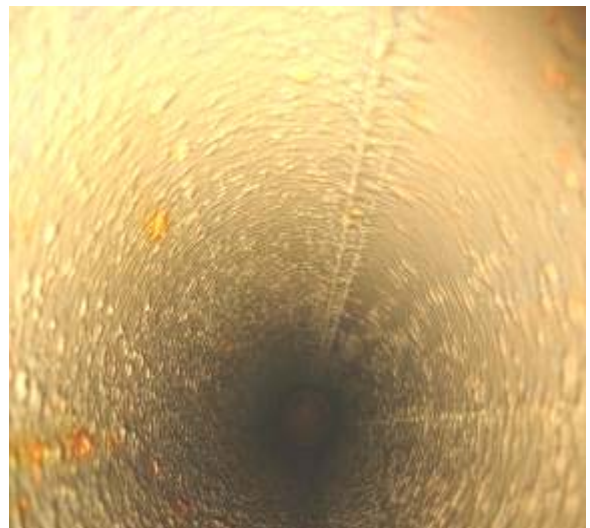
C-1 Cool water analysis at Area-2
pH = 6.74 , Temperature = 32.1oC
Conductivity = 36.1 μscm



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.

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 $U = \frac{Q}{A \Delta T_{lm}}$

ΔT_{lm} = different between Log – mean – temperature

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

$$\ln \left[\frac{(T_{h,i} - T_{c,o})}{(T_{h,o} - T_{c,i})} \right]$$



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

$$Q = [mc_p (T_i - T_o)]_h = [mc_p (T_o - T_i)]_c$$

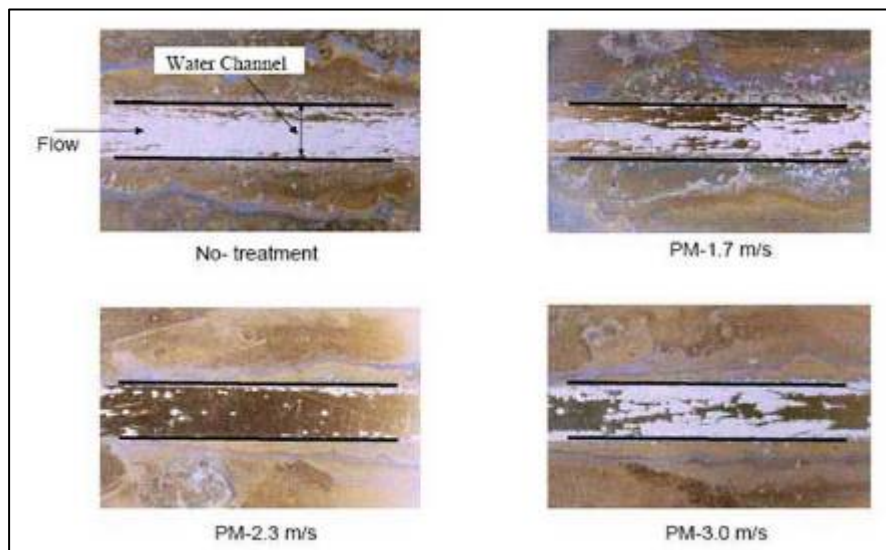
Remark

- 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.

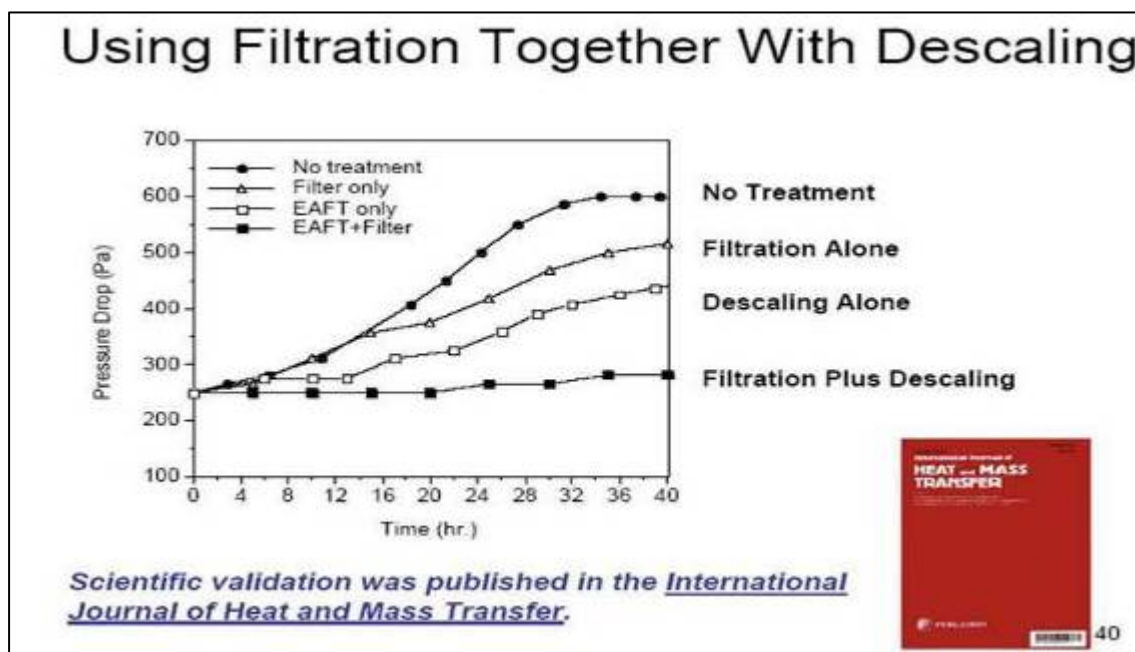
Conclusion

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

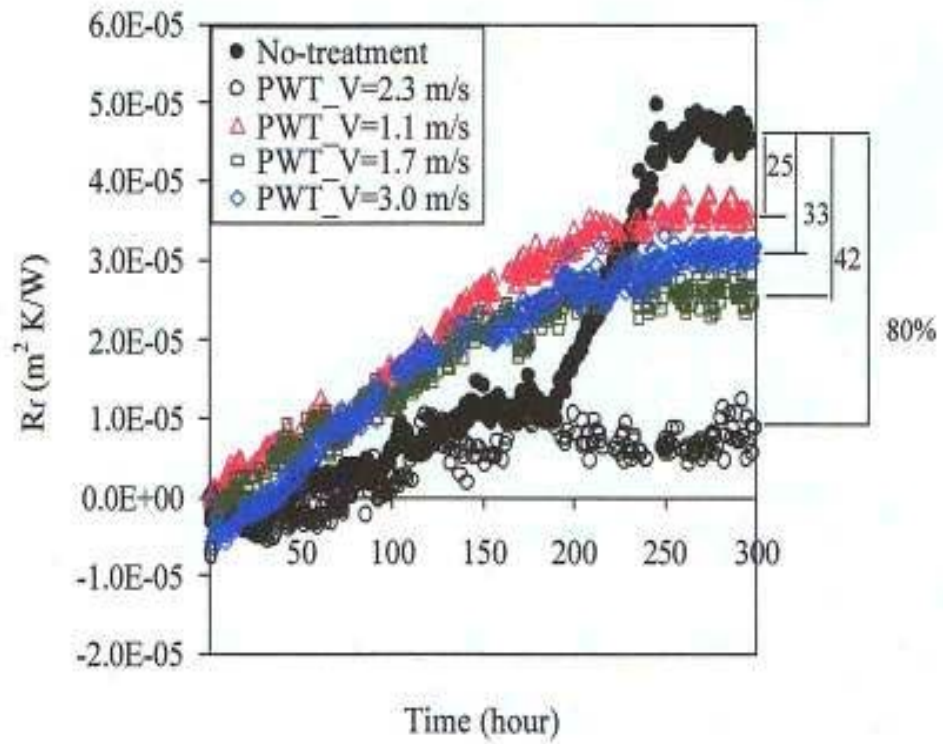


Fig.1 Variations of fouling resistance vs. time for four different flow velocity cases through PWT

Velocity Effect with PWT - 14



Fig. 2a

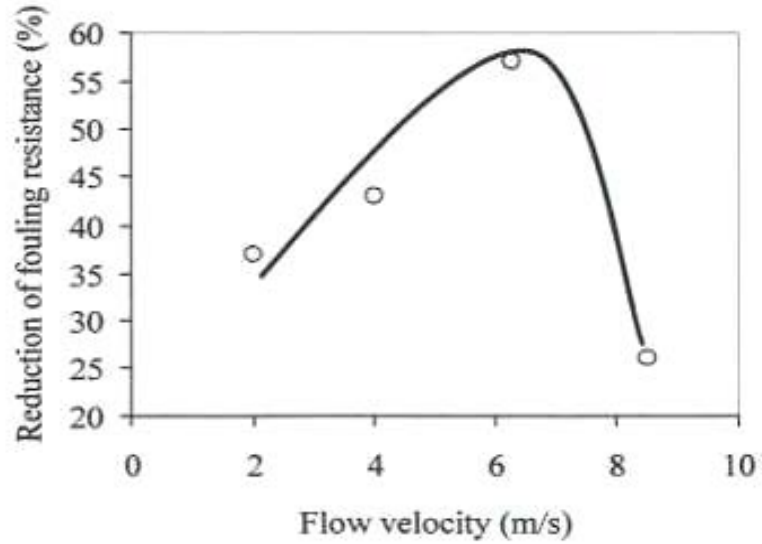


Fig. 2b

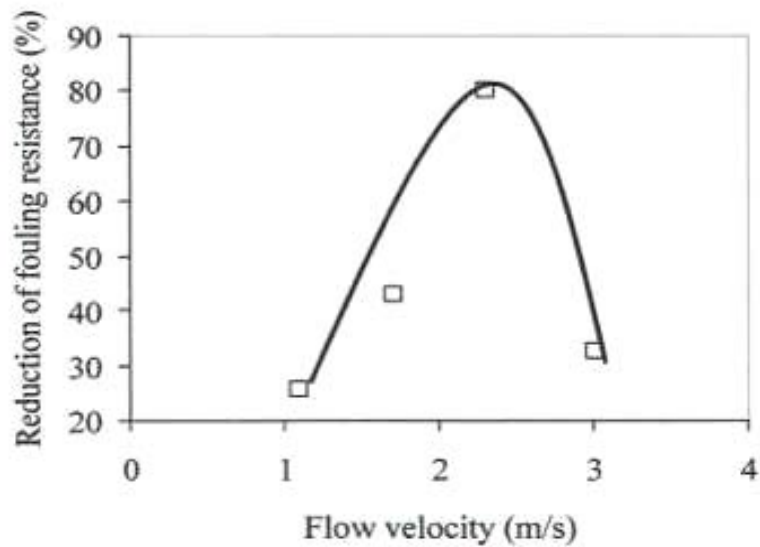


Figure.2 (a) Performance of PWT over a range of flow velocity , and (b) Performance of PWT over a range of flow velocity

Velocity Effect with PWT - 15








No- treatment	
PWT- 1.1 m/s	
PWT- 1.7 m/s	
PWT- 2.3 m/s	
PWT- 3.0 m/s	

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

Velocity Effect with PWT - 16

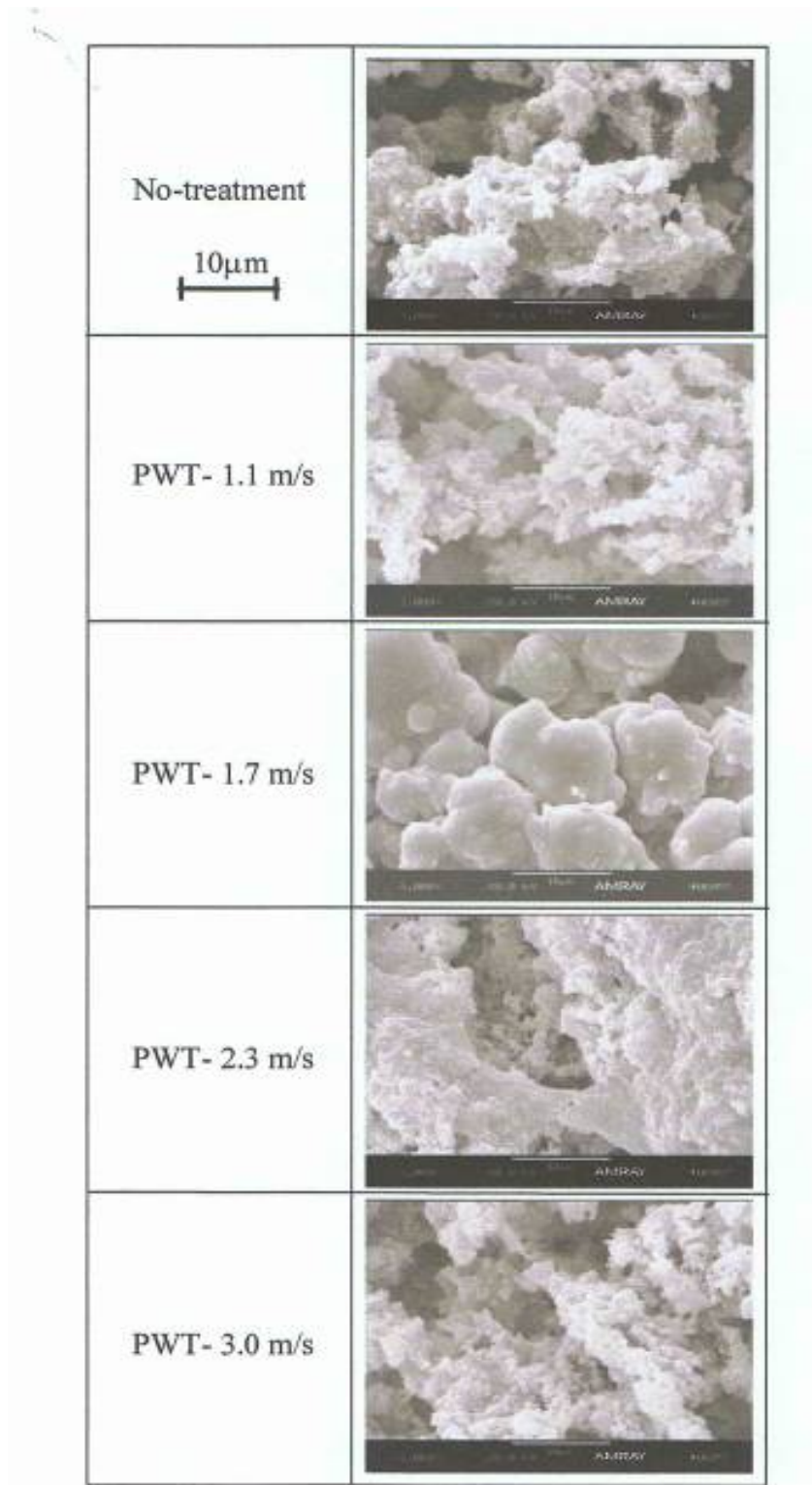


Fig. 4 SEM photographs for all cases , 3000X
Velocity Effect with PWT - 17

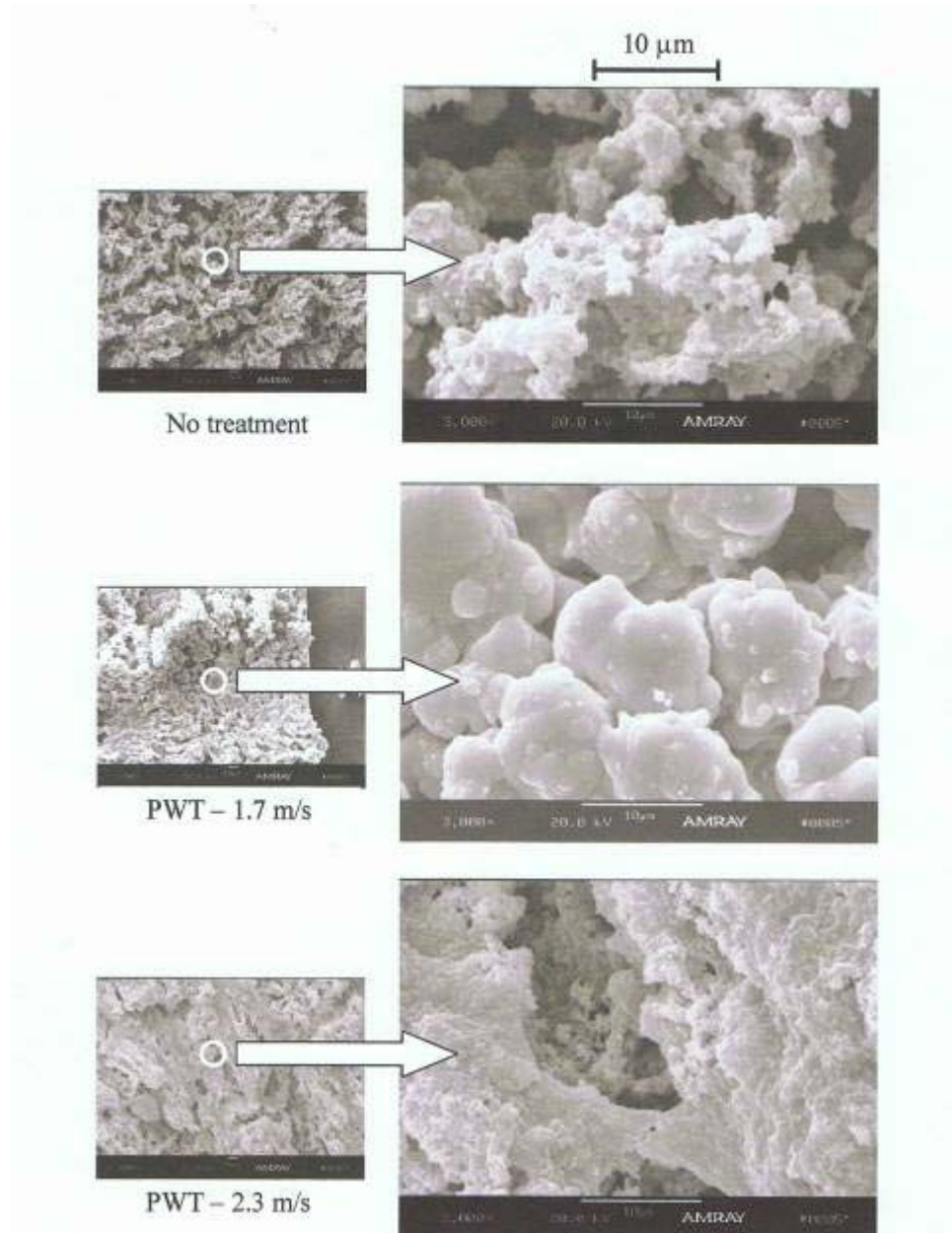


Fig. 5 SEM photographs for cases of no treatment, PWT – 1.7 and 2.3 m/s, 3000X

Velocity Effect with PWT - 18

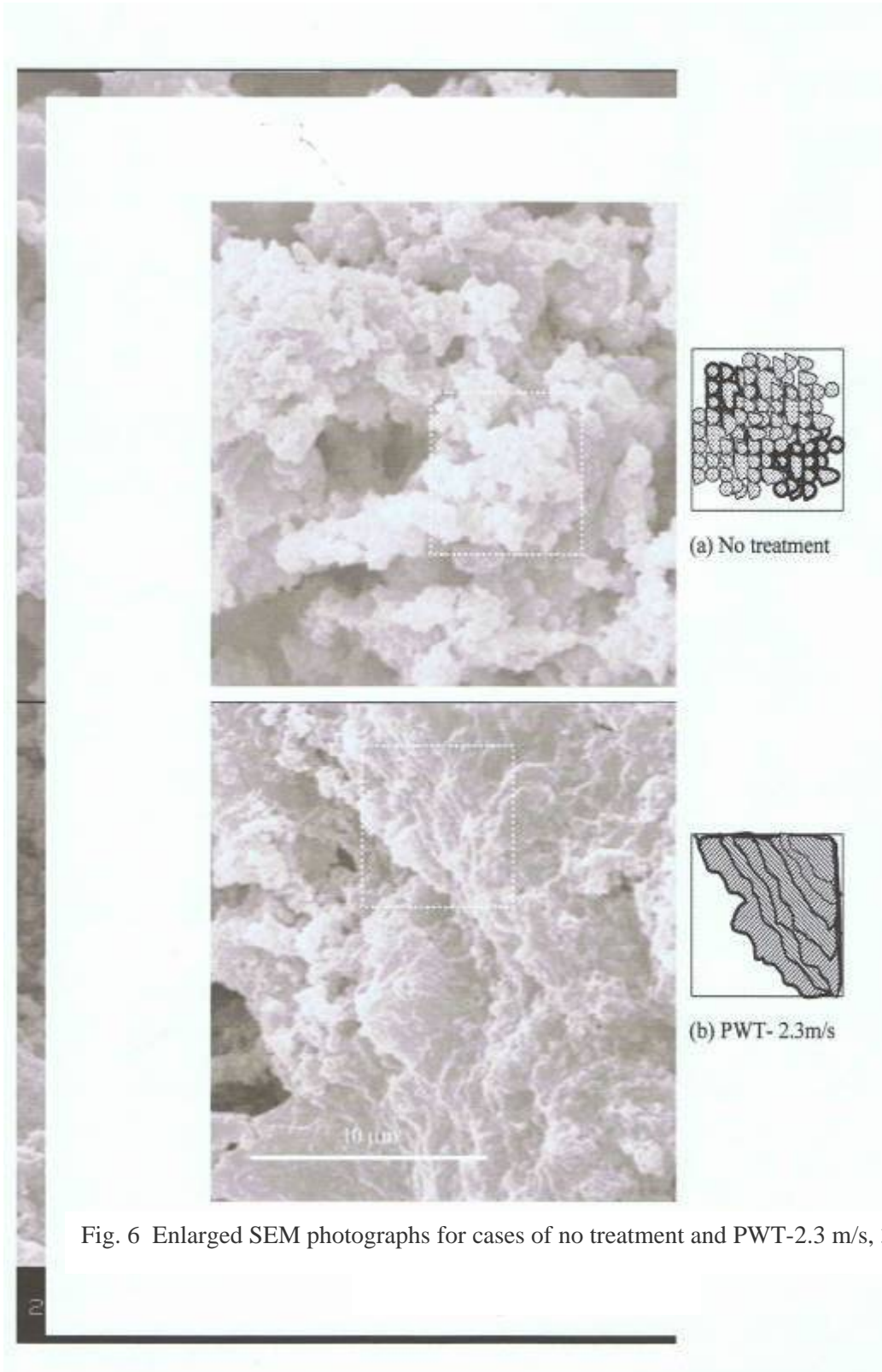


Fig. 6 Enlarged SEM photographs for cases of no treatment and PWT-2.3 m/s, 3,000X



		<h2 style="margin: 0;">Calibration Report</h2> <h3 style="margin: 0;">PD-FO-009</h3>										<p style="font-size: small; margin: 0;">FLOW MASTER (THAILAND) CO., LTD. 159 soi Rama IX 57/1(westsookz), suanluang Suanluang Bangkok 10250 Thailand Tel. 0-23745744-6 Fax 0-23745737 Santi@flowmaster.co.th</p>							
		Master Solution Provided					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		24-๘.๙.-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)		Velocity		Flow(l/hr)		Totalizer(l)		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		Total		0.00		0.0%	
								TESTED BY		FLOWMASTER(THAILAND)CO.,LTD				WITNESS BY					
COMPANY														Thai sun					
SIGNATURE																			
NAME				Mr. Santi Jitngamkham														Mr. Metha Silisriwanich	
DATE				25-๘.๙.-09														25-๘.๙.-09	



<h2 style="margin: 0;">Calibration Report</h2> <h3 style="margin: 0;">PD-FO-010</h3>		<p style="font-size: small;">FLOWMASTER (THAILAND) CO., LTD. 109 soi Rama IX 5711(Wisecorss), suanlaung Suanlaung, Bangkok, 10250 Thailand Tel. 0-23745744-6 Fax 0-23745737 Santi@flowmaster.co.th</p>	
Master Solution Provided		Meter Under Test Data	
Station name	NHK	Manufacturer	SIEMENS
Instrument Name	Outlet Water	Model	1010WPTR-T1GZ
Instrument Code	PD-FO-009	Trans S/N.	U20383
Report No.	SJ 0912004	Cert. No.	L0907-224
Date	24-S.P.-2009	Date issued	29 Jul 09
		Manufacturer	
		Model	
		Part No.	
		S/N.	
		Meter factor	

<h2 style="margin: 0;">Calibration Chart</h2>	
	<p style="text-align: center;">Time (เวลา)</p>

<p style="text-align: center;">TESTED BY</p> <p style="text-align: center;">FLOWMASTER(THAILAND)CO.,LTD</p>	<p style="text-align: center;">WITNESS BY</p> <p style="text-align: center;">Thai sun</p>
<p style="text-align: center;">SIGNATURE</p>	
<p style="text-align: center;">NAME</p> <p style="text-align: center;">Mr. Santi Jitngamkham</p>	<p style="text-align: center;">NAME</p> <p style="text-align: center;">Mr. Metha Sisinwanich</p>
<p style="text-align: center;">DATE</p> <p style="text-align: center;">25-S.P.-09</p>	<p style="text-align: center;">DATE</p> <p style="text-align: center;">25-S.P.-09</p>