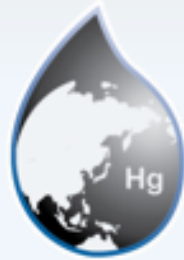


Session IV



Asia Pacific Mercury
Monitoring Network

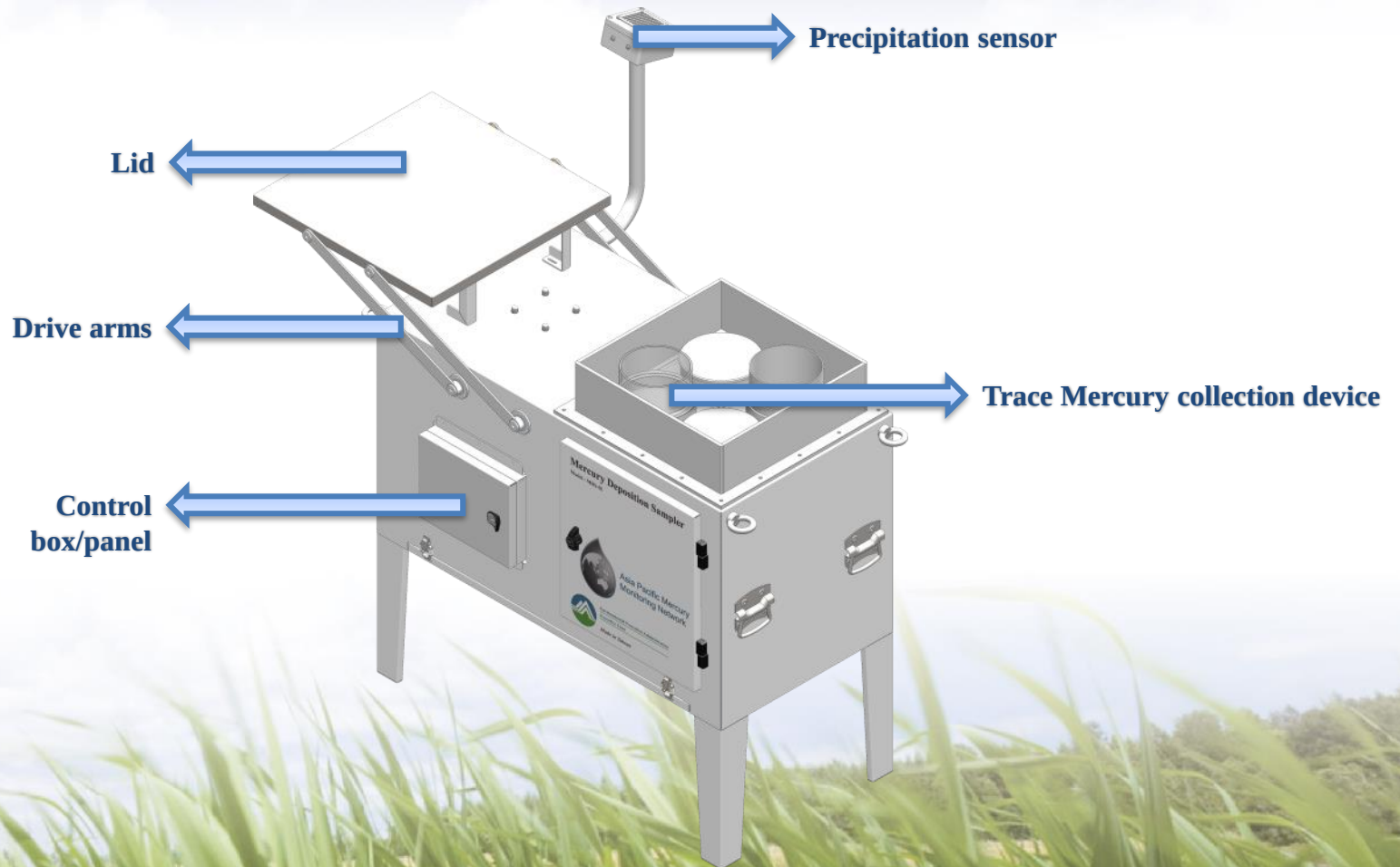
APMMN Mercury Wet Deposition Roundtable Discussion

Mercury Deposition Sampler

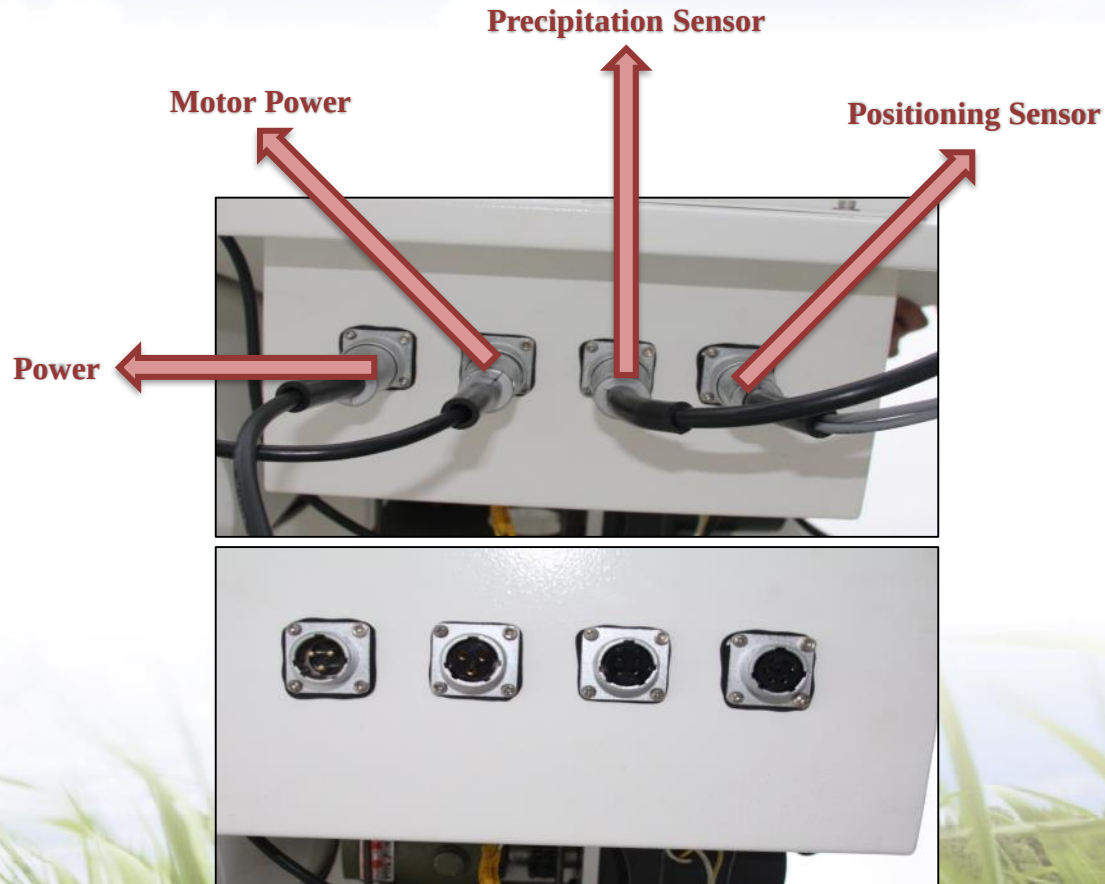


Contact:
Cheng Jung Huang, General Manager
asir@machine-shop.com.tw

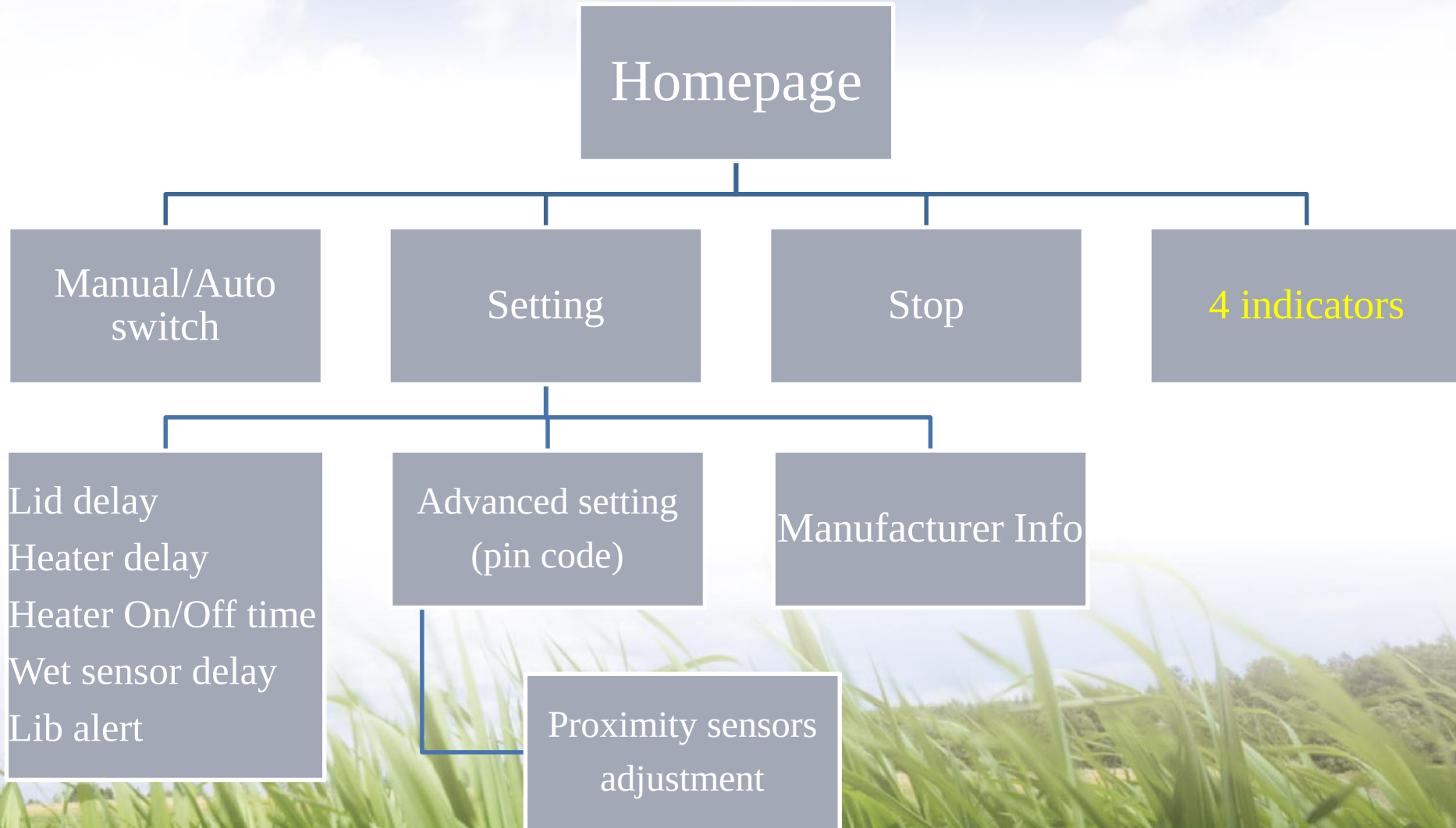
External item of the equipment



Internal item of the equipment



Control panel



Internal item of the equipment



Shaft coupling

Sensor positioning sheet

Flat cover closing positioning sensor

Flat cover opening positioning sensor

Description of Operation

When precipitation sensor detects precipitation.



“Precipitation” light on controller monitor will be on. Then “Heater” will light on and shine followed by setting.

Cover open	Precipitation	Manual OFF
		
Cover close	Heater	Auto ON
		
Setting	Stop	

For example, set Heater ON to 10 seconds and Heater OFF to 5 seconds. “Heater” light will repeat shining 10 seconds and then going out 5 seconds until “Precipitation” light off.

Description of Operation

When “Precipitation” lights on, flat cover will open and start to collect mercury deposition



While the flat cover opening, Sensor positioning sheet will synchronously rotate with it until be detected by Flat cover opening positioning sensor with lighting on. Then flat cover will stop. “Cover open” on controller monitor will light on.



Cover open	Precipitation	Manual
☒	☒	
Cover close	Heater	Auto
☐	☒	
Setting	Stop	ON

Description of Operation

When precipitation sensor doesn't detect precipitation.



“Precipitation” light on controller monitor will be off. Then “Heater” will light of.

Cover open	Precipitation	Manual OFF
		
Cover close	Heater	Auto ON
		
Setting	Stop	

Description of Operation

When “Precipitation” lights off, flat cover will close.



While the flat cover closing, Sensor positioning sheet will synchronously rotate with it until be detected by Flat cover closing positioning sensor with lighting on. Then flat cover will stop. “Cover close” on controller monitor will light on



Cover open	Precipitation	Manual OFF
☐	☐	
Cover close	Heater	Auto ON
☒	☐	
Setting	Stop	

Description of Operation

When “Precipitation” lights off, flat cover will close.

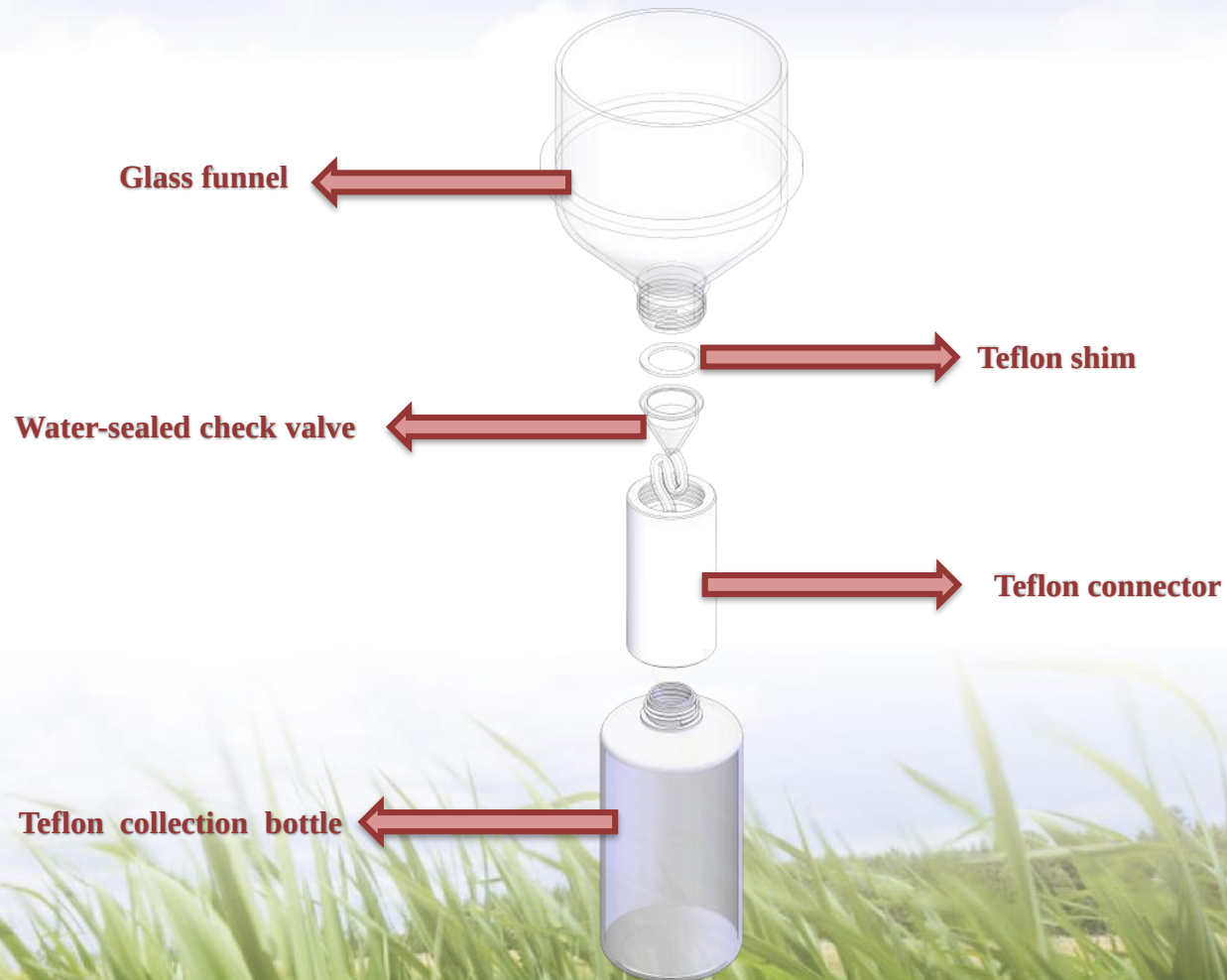


While the flat cover closing, Sensor positioning sheet will synchronously rotate with it until be detected by Flat cover closing positioning sensor with lighting on. Then flat cover will stop. “Cover close” on controller monitor will light on



Cover open	Precipitation	Manual OFF
☐	☐	
Cover close	Heater	Auto ON
☒	☐	
Setting	Stop	

Trace mercury collection device



Standard Operating Procedures for APMMN

Da-Wei Lin and Guey-Rong Sheu



Asia Pacific Mercury
Monitoring Network



Center for Environmental
Monitoring and Technology
National Central University

Current SOP

Asia – Pacific Mercury Monitoring Network (APMMN)

Mercury Wet Deposition Network Field Standard Operating Procedures

Version 1.3-, February, 2015

- Based on MDN/NADP SOP.
- Revised Ver. 1.3 by EPAT, USEPA, NADP, NCU, Vietnam and Thailand in 2015

Asia Pacific Mercury
Monitoring Network

<http://apmmn.org>

About APMMNSite InfoDataWorkshopsEducationTrainingPublicationsLinksContacts

Publications

APMMN Field Sample SOP

Sampling and analysis method

UNEP documents

APMMN Field Sample SOP

- APMMN Field Sample SOP [\[PDF\]](#)

Asia – Pacific Mercury Monitoring Network (APMMN)
Mercury Wet Deposition Network Field Standard Operating
Procedures
Version 1.3-, February, 2015



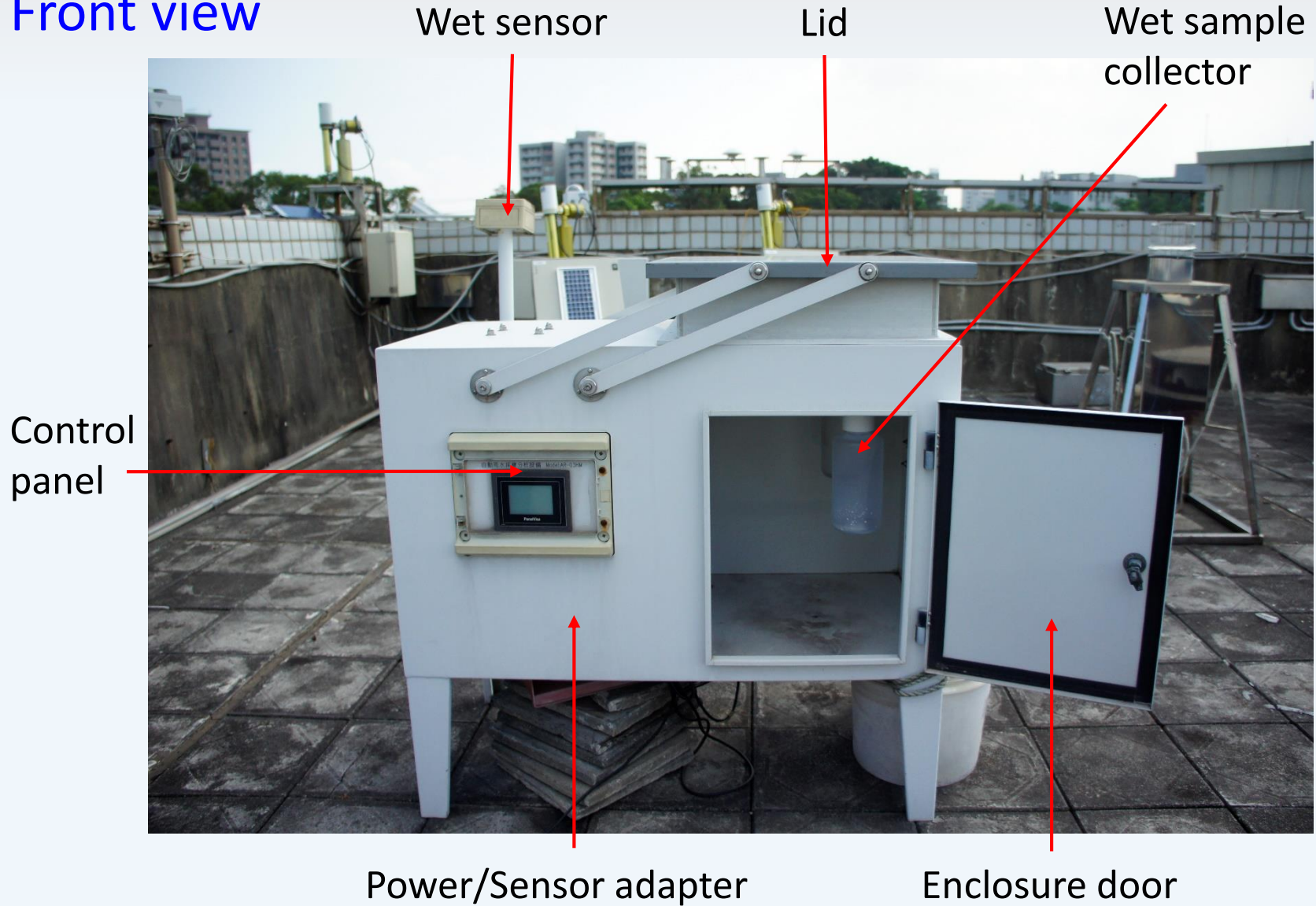
RECENT NEWS

- [2018 NADP Annual Meeting](#)
Nov 5 - 9, 2018
Albany, NY, US
- [ICMGP 2019](#)
Sep 8-13, 2019
Karkow, Poland

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Wet-only precipitation collector-MIC type

Front view

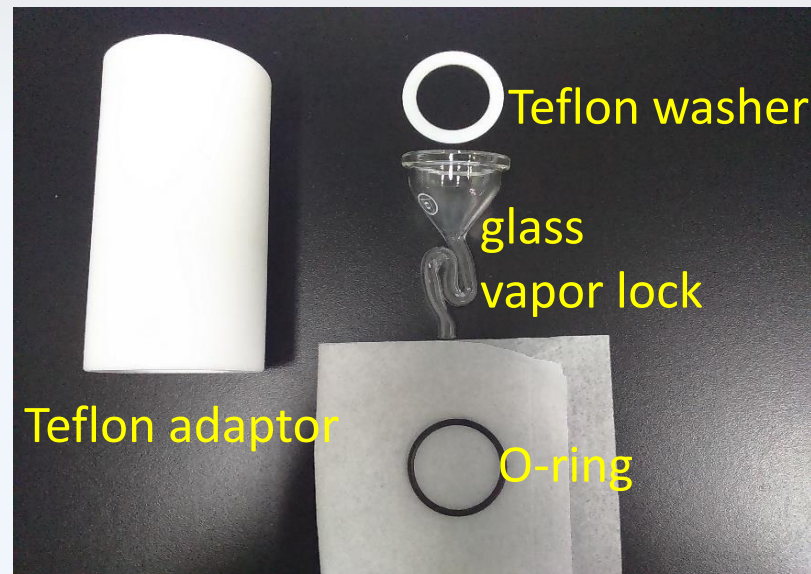


Wet-only precipitation collector-MIC type

Top view



Mercury collection device



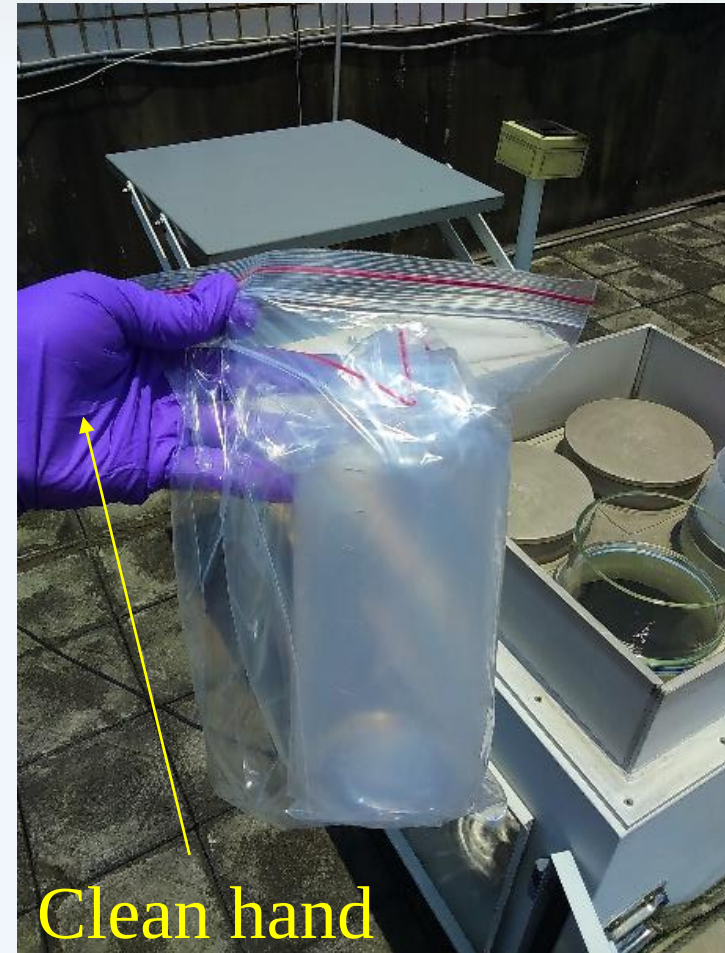
Retrieve your sample

- Changes on Tuesday morning between 8 to 10 am LT
- Approach collector **facing into the wind**
- Open the enclosure door
- **Put on the gloves**
- Take off PFA sample bottle



Retrieve your sample

- Cap the bottle
- Take 2 plastic bags to cover bottle



Retrieve your sample

- Open the lid
- Take out the used sample collector (funnel)
- Fill in the **Network Observer Form**



Network Observer Form (NOF)

OBSERVER FORM										Courier/Tracking # _____																																																																																																																																																								
Send Completed Form With Each Shipping										LAB ID _____																																																																																																																																																								
1. STATION Name _____ ID [][] [][]					2. OBSERVER Print name _____ Initials [][] [][]																																																																																																																																																													
3. BOTTLE Date <table border="1" style="margin: auto;"> <tr><th>Month</th><th>Day</th><th>Year</th></tr> <tr><td> </td><td> </td><td> </td></tr> </table> Time <table border="1" style="margin: auto;"> <tr><th>Hour</th><th>Minute</th></tr> <tr><td> </td><td> </td></tr> </table> ON [][] [][] OFF [][] [][]					Month	Day	Year				Hour	Minute																																																																																																																																																						
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5. OBSERVATIONS Check yes or no if samples were observed to have any of the following: Describe all observations in Block 10. <table style="width: 100%;"> <tr> <td style="width: 50%;"> <table border="1" style="font-size: small;"> <tr><th>YES</th><th>NO</th></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> </table> 1. Bird droppings 2. Cloudy or discolored 3. Soot/ash/dirt particles </td> <td style="width: 50%;"> <table border="1" style="font-size: small;"> <tr><th>YES</th><th>NO</th></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> </table> 4. Insects/animal matter 5. Leaves/twigs/pollen/plant matter 6. Handling contamination </td> </tr> </table>					<table border="1" style="font-size: small;"> <tr><th>YES</th><th>NO</th></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> </table> 1. Bird droppings 2. Cloudy or discolored 3. Soot/ash/dirt particles	YES	NO	[]	[]	[]	[]	[]	[]	[]	[]	<table border="1" style="font-size: small;"> <tr><th>YES</th><th>NO</th></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> </table> 4. Insects/animal matter 5. Leaves/twigs/pollen/plant matter 6. Handling contamination	YES	NO	[]	[]	[]	[]	[]	[]	[]	[]	6. SITE OPERATIONS Check yes or no for all samples. <table style="width: 100%;"> <tr> <td style="width: 50%;"> <table border="1" style="font-size: small;"> <tr><th>YES</th><th>NO</th></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> </table> 1. Sensor heater and motor box are operating properly. Lid is in correct position. 2. Raingauge operated properly during the week. </td> <td style="width: 50%;"></td> </tr> </table>					<table border="1" style="font-size: small;"> <tr><th>YES</th><th>NO</th></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> <tr><td>[]</td><td>[]</td></tr> </table> 1. Sensor heater and motor box are operating properly. Lid is in correct position. 2. Raingauge operated properly during the week.	YES	NO	[]	[]	[]	[]	[]	[]	[]	[]																																																																																																																								
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7. PRECIPITATION RECORD R - Rain Only (includes Hail) S - Snow Only M - Mixture U - Unknown <table style="width: 100%; font-size: x-small;"> <tr> <th>Type</th> <th colspan="3">MON</th> <th colspan="3">TUES</th> <th colspan="3">WED</th> <th colspan="3">THURS</th> <th colspan="3">FRI</th> <th colspan="3">SAT</th> <th colspan="3">SUN</th> <th colspan="3">MON</th> <th colspan="3">TUES</th> <th colspan="3">WED</th> </tr> <tr> <td>Circle one</td> <td>R</td><td>S</td><td>M</td><td>U</td><td>R</td><td>S</td><td>M</td><td>U</td><td>R</td><td>S</td><td>M</td><td>U</td><td>R</td><td>S</td><td>M</td><td>U</td><td>R</td><td>S</td><td>M</td><td>U</td><td>R</td><td>S</td><td>M</td><td>U</td><td>R</td><td>S</td><td>M</td><td>U</td> </tr> <tr> <td>Inches</td> <td colspan="30"> </td> </tr> <tr> <td>or</td> <td colspan="30"> </td> </tr> <tr> <td>Circle one</td> <td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td><td>Z</td><td>T</td><td>MM</td> </tr> </table> Z - Zero T - Trace MM - Missing Total Precipitation [][] [][]										Type	MON			TUES			WED			THURS			FRI			SAT			SUN			MON			TUES			WED			Circle one	R	S	M	U	R	S	M	U	R	S	M	U	R	S	M	U	R	S	M	U	R	S	M	U	R	S	M	U	Inches																															or																															Circle one	Z	T	MM	Z	T	MM	Z	T	MM	Z	T	MM	Z	T	MM	Z	T	MM	Z	T	MM	Z	T	MM	Z	T	MM	Z	T	MM
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8. OVERFLOW (check one) Overflow [][] [][] mL										<table border="1" style="font-size: x-small;"> <tr><th>YES</th><th>NO</th></tr> <tr><td>[]</td><td>[]</td></tr> </table>		YES	NO	[]	[]																																																																																																																																																			
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9. ENCLOSURE TEMPERATURE MAXIMUM [][] [][] °C MINIMUM [][] [][] °C										Laboratory Use Only Preservation: HCL [][] [][] mL BrCl [][] [][] mL Composition: [][] [][] mL Split: [][] [][] mL Spill Bottle ID [][] [][]																																																																																																																																																								
10. REMARKS For example: equipment malfunction, contamination, farming, burning, logging, leakage, etc. 										Laboratory Use Only Comp. Bottle ID [][] [][]																																																																																																																																																								

1. Station
2. Observer
3. Bottle
4. Observations
5. Site operations
6. Precip. record
7. Overflow
8. Enclosure Temp.
9. Remarks

Lab/APMMN
use only

Cleaning the collector

- Clean any surfaces by DI Water and paper towel
- Clean any debris off sensor by brush or compressed air

Dirty hand



Deployment of new sample collector

- Change your gloves !
- Deploy new sample collector
- Avoid to touch the inner surface of glass funnel
- Close the lid and enclosure door
- Write a NOF for coming sample



Weigh, transfer and storage

- Weigh the sample bottle and subtract the weight of empty bottle (recode it on the NOF)
- Carefully pour the sample from 1L to 125mL sample bottle



Weigh, transfer and storage

- Label the sample with sampling site ID, start/end date
- Place the sample into **double** sealable plastic bag
- Store the sample in a **Hg-free** and secure place (or refrigerator) if not shipping immediately.
- Capture rain gauge data
- Complete the NOF



Sample label

- The most important part of taking sample

Site ID

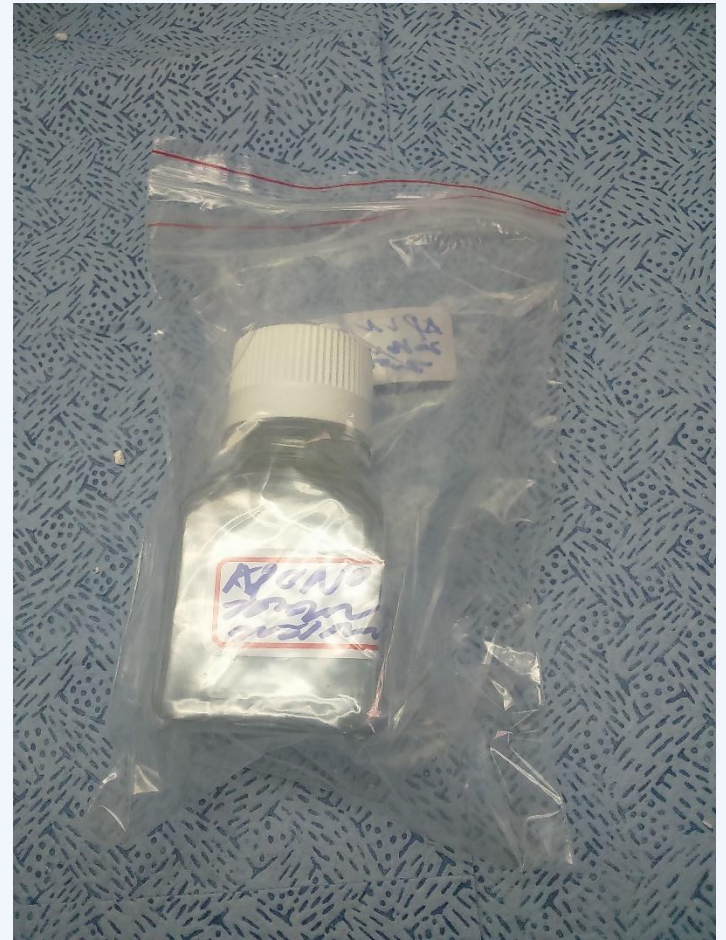
Start Date (MM/dd/yyyy)

End Date

APTW01

08/28/2018

09/04/2018



Shipping Info.

Ship samples at least **monthly** by int'l logistics service

Ex:



- Pack samples and NOFs singly or in bulk
- Cold shipping is unnecessary
- **Description of goods : Rainwater**

Dr. Guey-Rong Sheu

APMMN

Department of Atmospheric Sciences National Central University

300 Jhong-Da Road Jhong-Li 320, Taiwan

Acid Clean of Collection Devices

Material/Equipment

- Personal Protective Equipment
- Deionized water – $\rho \geq 18.2 \text{ M}\Omega$
- **Hydrochloric acid** – J.T Baker Hydrochloric Acid, 36.5-38.0%, BAKER INSTRA-ANALYZED[®] Reagent or equivalent
- PE box/tank

Certificate of Analysis

Hydrochloric Acid, 36.5–38.0%
BAKER INSTRA-ANALYZED® Reagent
For Trace Metal Analysis



Material No.: 9530-00
Batch No.: 0000083492
Manufactured Date: 2014/04/22
Retest Date: 2019/04/21

Certificate of Analysis

Test	Specification	Result
ACS – Assay (as HCl) (by acid–base titrn)	36.5 – 38.0 %	37.7
ACS – Color (APHA)	<= 10	5
ACS – Residue after Ignition	<= 3 ppm	1
ACS – Specific Gravity at 60°/60°F	1.185 – 1.192	1.190
ACS – Bromide (Br)		
ACS – Extractable Organic Substances		
ACS – Free Chlorine (as Cl ₂)		
Phosphate (PO ₄)		
Sulfate (SO ₄)		
Sulfite (SO ₃)		
Ammonium (NH ₄)		
Trace Impurities – Arsenic (As)		
Trace Impurities – Aluminum (Al)		
Arsenic and Antimony (as As)		
Trace Impurities – Barium (Ba)		
Trace Impurities – Beryllium (Be)		
Trace Impurities – Bismuth (Bi)		
Trace Impurities – Boron (B)		
Trace Impurities – Cadmium (Cd)	<= 20.0 ppb	< 5.0
	<= 1.0 ppb	< 1.0

Hydrochloric Acid, 36.5–38.0%
BAKER INSTRA-ANALYZED® Reagent
For Trace Metal Analysis

Material No.: 9530-00
Batch No.: 0000083492

Test	Specification	Result
Trace Impurities – Germanium (Ge)	<= 3.0 ppb	< 2.0
Trace Impurities – Gold (Au)	<= 4.0 ppb	< 0.2
Heavy Metals (as Pb)	<= 100 ppb	< 50
Trace Impurities – Iron (Fe)	<= 15.0 ppb	1.9
Trace Impurities – Lead (Pb)	<= 1.0 ppb	< 0.5
Trace Impurities – Lithium (Li)	<= 1.0 ppb	< 1.0
Trace Impurities – Magnesium (Mg)	<= 10.0 ppb	< 1.0
Trace Impurities – Manganese (Mn)	<= 1.0 ppb	< 1.0
Trace Impurities – Mercury (Hg)	<= 0.5 ppb	0.3
Trace Impurities – Molybdenum (Mo)	<= 10.0 ppb	< 5.0
Trace Impurities – Nickel (Ni)	<= 4.0 ppb	< 0.3
Trace Impurities – Niobium (Nb)	<= 1.0 ppb	< 1.0
Trace Impurities – Potassium (K)	<= 9.0 ppb	< 1.0
Trace Impurities – Selenium (Se), For Information Only	ppb	1.0
Trace Impurities – Silicon (Si)	<= 100.0 ppb	< 10.0
Trace Impurities – Silver (Ag)	<= 1.0 ppb	< 1.0
	ppb	< 5.0
	ppb	< 1.0
	ppb	< 0.9
	ppb	< 5.0
	ppb	< 0.8
	ppb	< 1.0
	ppb	< 1.0
	ppb	< 1.0
	ppb	< 1.0

Country of Origin: US

ACS – Assay (as HCl) (by acid–base titrn) 36.5 – 38.0 % 37.7

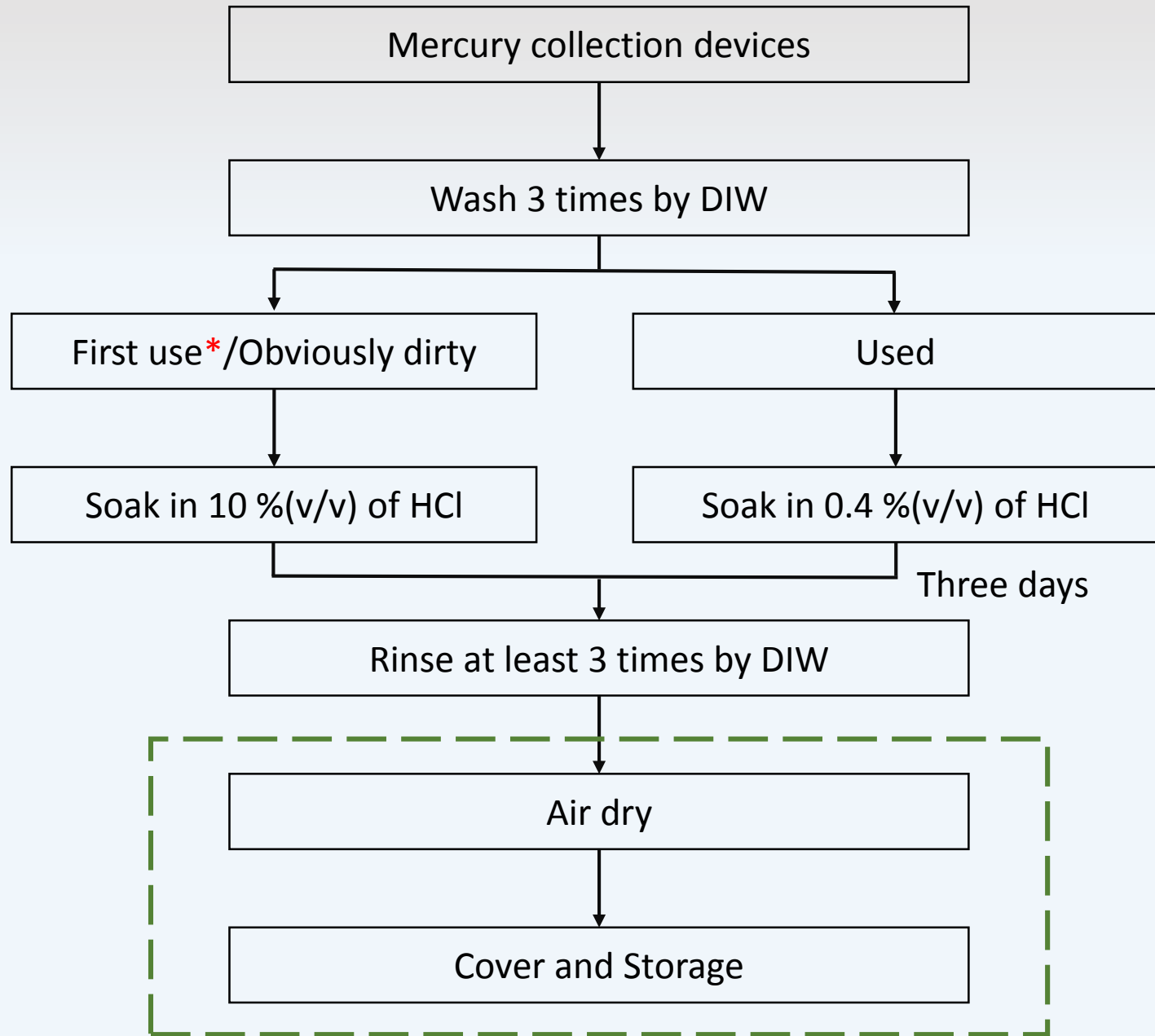
Trace Impurities – Mercury (Hg) <= 0.5 ppb 0.3

For questions on this Certificate of Analysis please contact Technical Services at 855.282.6867 or +1.610.573.2600
Avantor™ Performance Materials Inc.
3477 Corporate Parkway, Suite #200, Center Valley, PA 18034, U.S.A. Phone: 610.573.2600 . Fax: 610.573.2610

ISO
Phillipsburg, NJ 9001:2008, 14001:2004
Paris, KY 9001:2008
Mexico City, Mexico 9001:2008
Deventer, The Netherlands 9001:2008, 14001:2004, 13485:2003
Gliwice, Poland 9001:2008, 17025:2005
Selangor, Malaysia 9001:2008
Delhi, India, 9001:2008, 14001:2004, 13485:2003
Mumbai, India, 9001:2008, 17025:2005
Panaji, India 9001:2008

Richard M. Siberski
Richard M. Siberski
Vice President Global Quality

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Avantor™ Performance Materials Inc.
3477 Corporate Parkway, Suite #200, Center Valley, PA 18034, U.S.A. Phone: 610.573.2600 . Fax: 610.573.2610



* : independent tank, fresh solution

Under the clean room/clean bench

Acid Clean of Collection Devices

- Separate the collection device and wash by DIW



Acid Clean of Collection Devices

- Soak within hydrochloric acid for 72 hours (**except O-ring**)



Acid Clean of Collection Devices

- Rinse thoroughly each component with deionized water ($\rho \geq 18.2 \text{ M}\Omega$) at least **3 times**



Acid Clean of Collection Devices

- Air dry each component in the clean bench



Acid Clean of Collection Devices

- Cover each component with clean plastic bag and store
- Assemble each component before use



Cases in the past years

Case 1:

No sealable plastic bag (double bags)

No lable on sample bottle



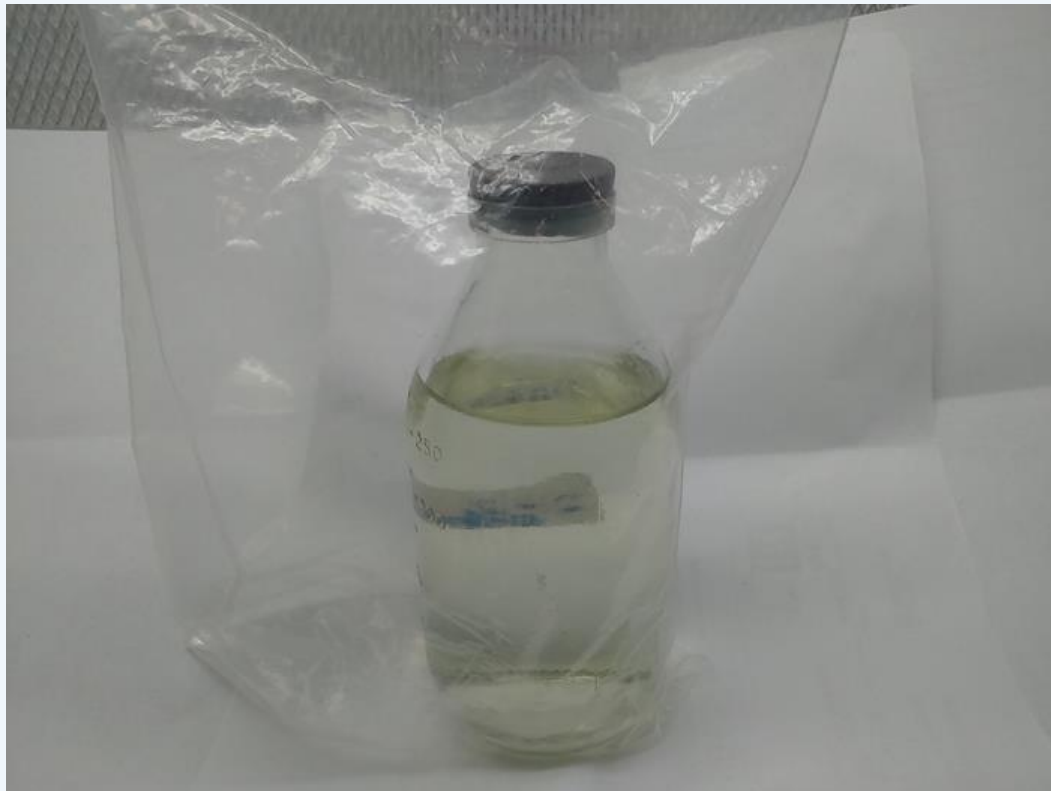
Cases in the past years

Case 2:

Single sealable plastic bag only

Number of Sample bottle and NOF were unequal

Not use the suggest PETG bottle



Cases in the past years

Case 3:

No label on the bottle

No NOF



THANK YOU

Da-Wei Lin
APMMN Site Liaison
dwlin@g.ncu.edu.tw