

Enhanced Orifice Plate Inspection Program (EOPIP)

PenEdu Learning, LLC





Some Background Info on This
Whole “EOPIP” Idea

Internal Corrosion



PRIMARY INTERNAL CORROSION ISSUES

1. Gas quality issues, H₂S and/or CO₂ in combination with liquid/free water
2. Bacteria (MIC)
3. Under deposit black powder, which can work in conjunction with 1 and 2
4. Oxygen entrained in gas stream (oxygen is not inherent in Natural Gas, so it is typically a contaminant from poorly operating compressors)



**Coupon removed Separator Vessel – 68
mpy corrosion rate (SEVERE)**

Enhanced Orifice Plate Inspection Program - EOPIP (basically 3 Tests)

Orifice Plates will be removed as per Operating Procedures (based on gas volume) and tested as follows:

1. Presence of Bacteria
2. Presence of Water
3. Presence of Black Powder



TWO INTERNAL CORROSION LEAKS IN PAST YEAR

1. Line 2AD-9
2. Line 8

Line Name (& size) ML2 + 3

P/L Station # ML2-4116+44 ML3-1726+11

Meter Station # 90540

Meter St. Name No Ark

Gas Input or Delivery? Input

Date 1-16-08

Last Inspection 10-12-07

Flow rate 0

Additional comments: Tube 2

Photograph showing EOPIP Form beside Orifice Plate with
"Minor" debris accumulation

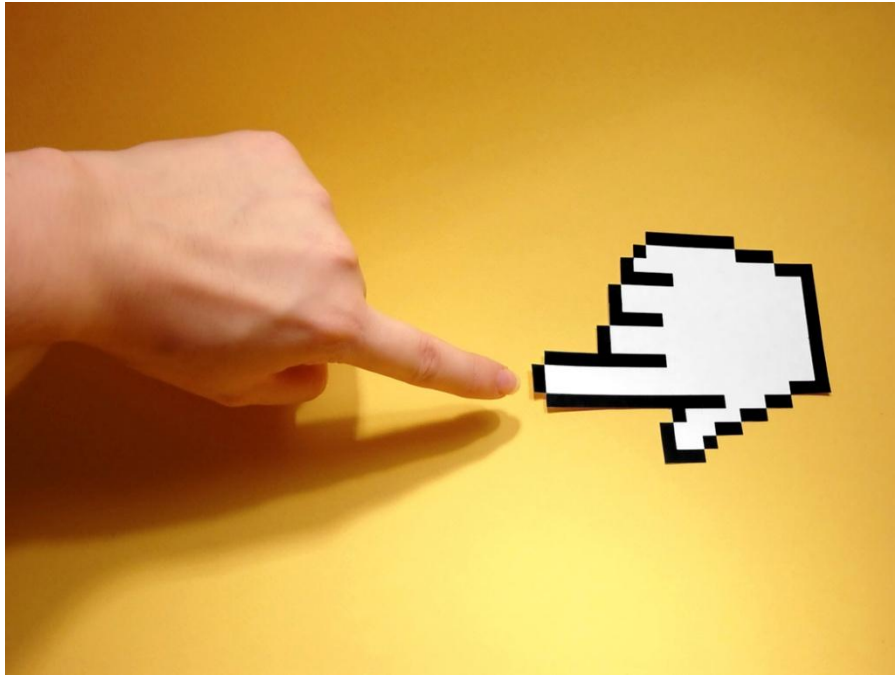


Photograph of Orifice Plate showing example of “Elevated” debris accumulation



In addition to EOPIP – Future Focus for ICMP

- | | |
|------------------------|----------------------|
| 1. Gas Quality | 3. Pigging |
| 2. Sampling/Monitoring | 4. Chemical Cleaning |



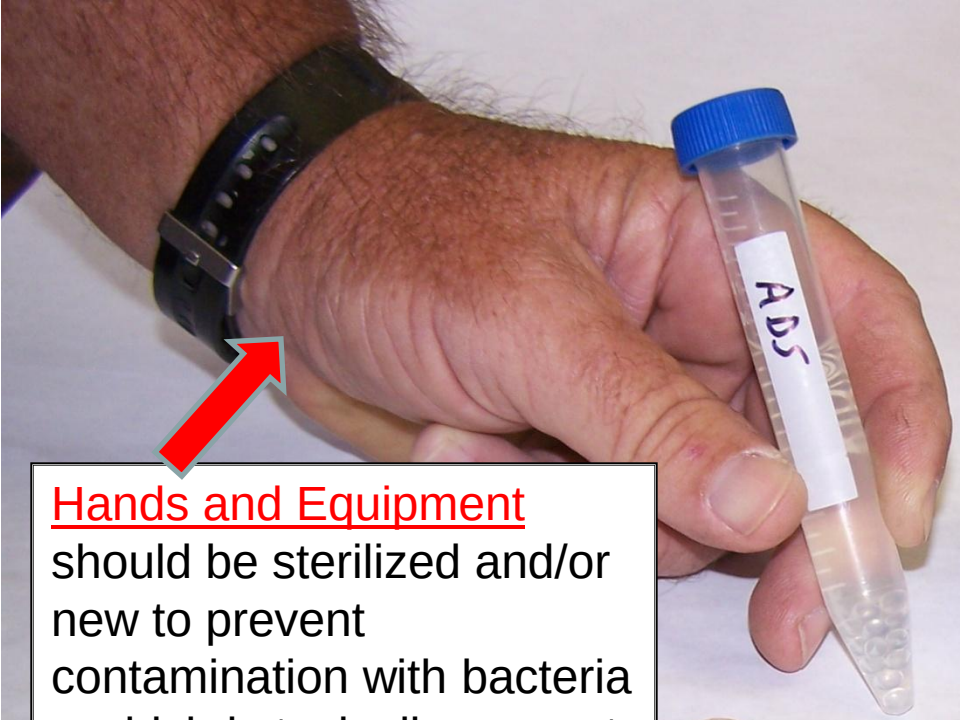
“Hands On Training”
EOPIP



Bacteria Testing EOPIP

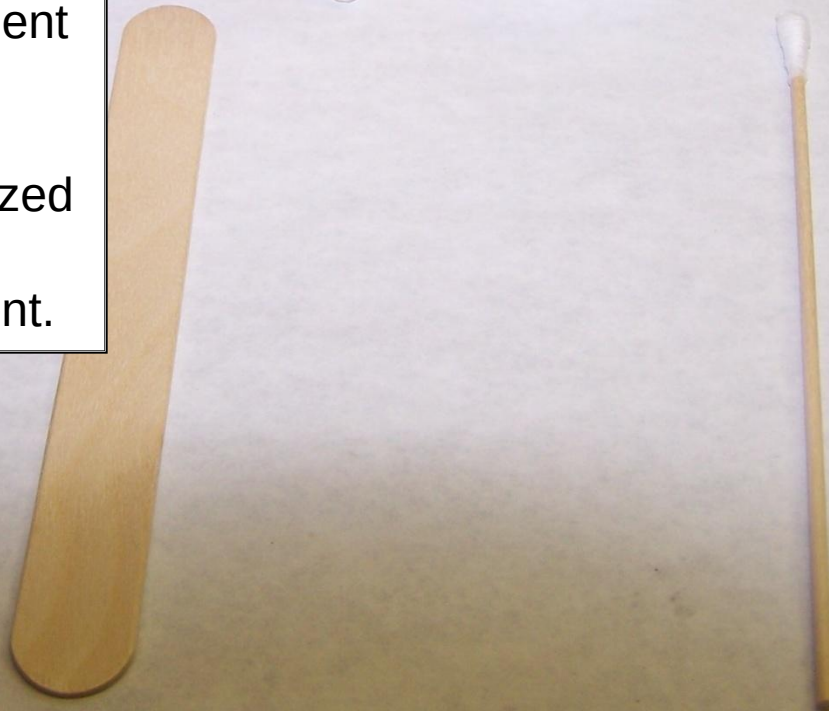
Collect solids/liquids sample from orifice plate using a NEW CLEAN sample bottle!

If Liquid – then skip ADS process
If Solid – need to use ADS



Hands and Equipment

should be sterilized and/or new to prevent contamination with bacteria – which is typically present everywhere – even on Mars! Wash hands thoroughly or use sterilized gloves prior to handling sample and/or equipment.



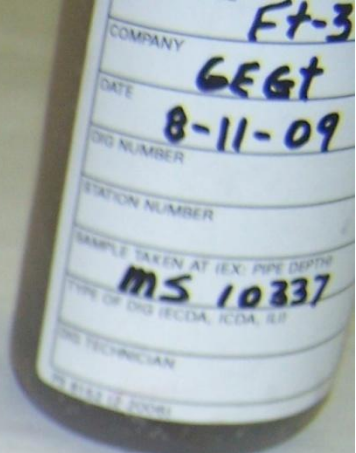
Solid sample needs to be diluted –
made into a liquid using the ADS –
swab the solids sample and insert
into the ADS vial





Shake solid sample
inside the ADS vial
to try to dissolve into
liquid solution

Using syringe,
extract 1 ml
sample solution



Using alcohol pads, sterilize the top of each vial to kill any contaminated bacteria that may be present and which might produce faulty positive results

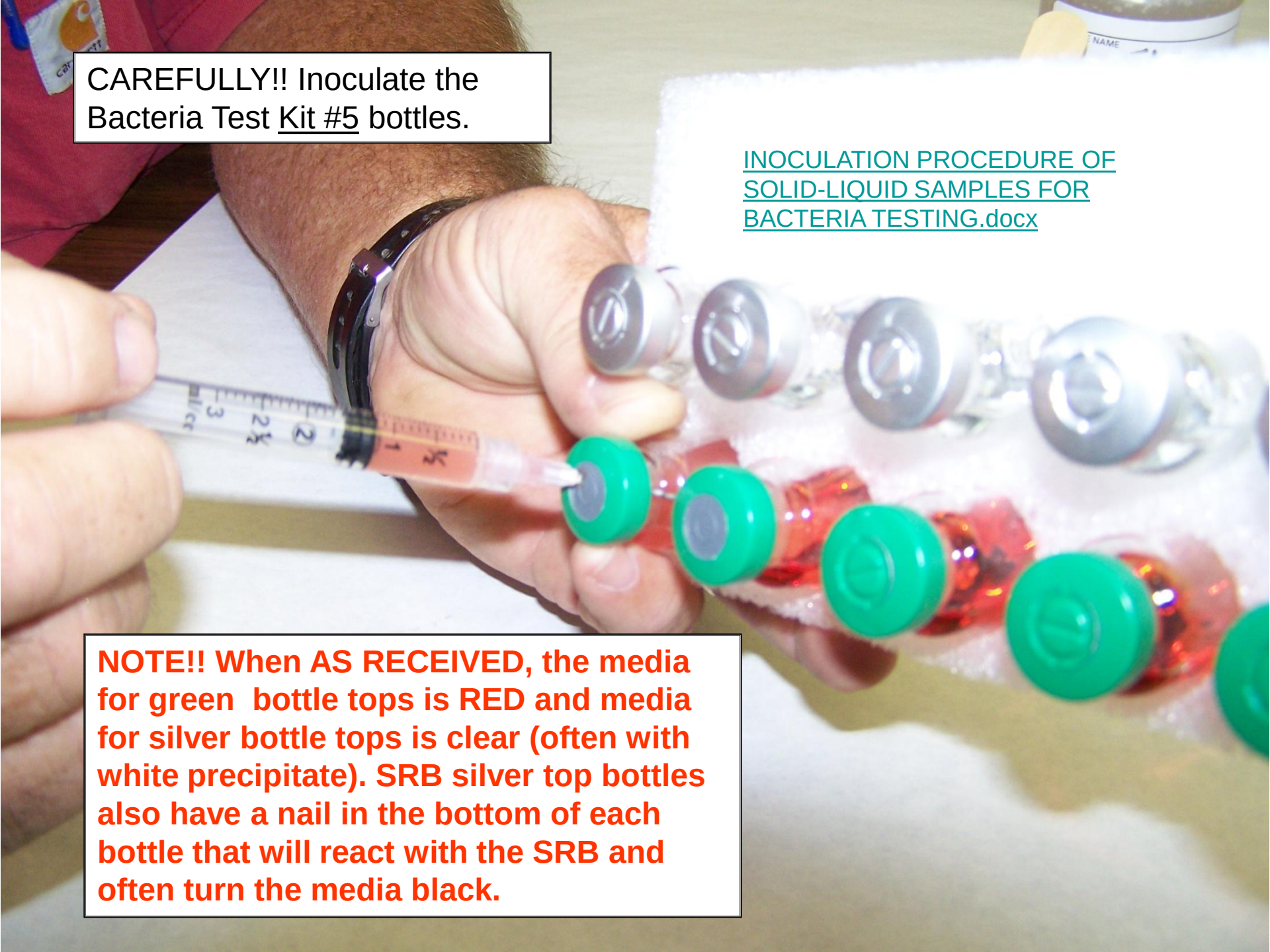
NOTE!! – This is a Dixie Kit #1 as it has Silver tops for Sulfate Reducing Bacteria (SRB) and Green tops for APB – we want **Dixie Kit #5** with Silver tops for SRB and **BLUE** tops for Anaerobic Bacteria (ANA)

One Kit #5 consists of 5 Serial Dilution bottles for testing for presence of Sulfate Reducing Bacteria (silver tops) and 5 bottles for testing for presence of Anaerobic Bacteria (blue tops). Called “serial dilution” because you start out with 1 mL sample solution and dilute the sample 5 times through a series of injections/withdrawals from one bottle to the next.

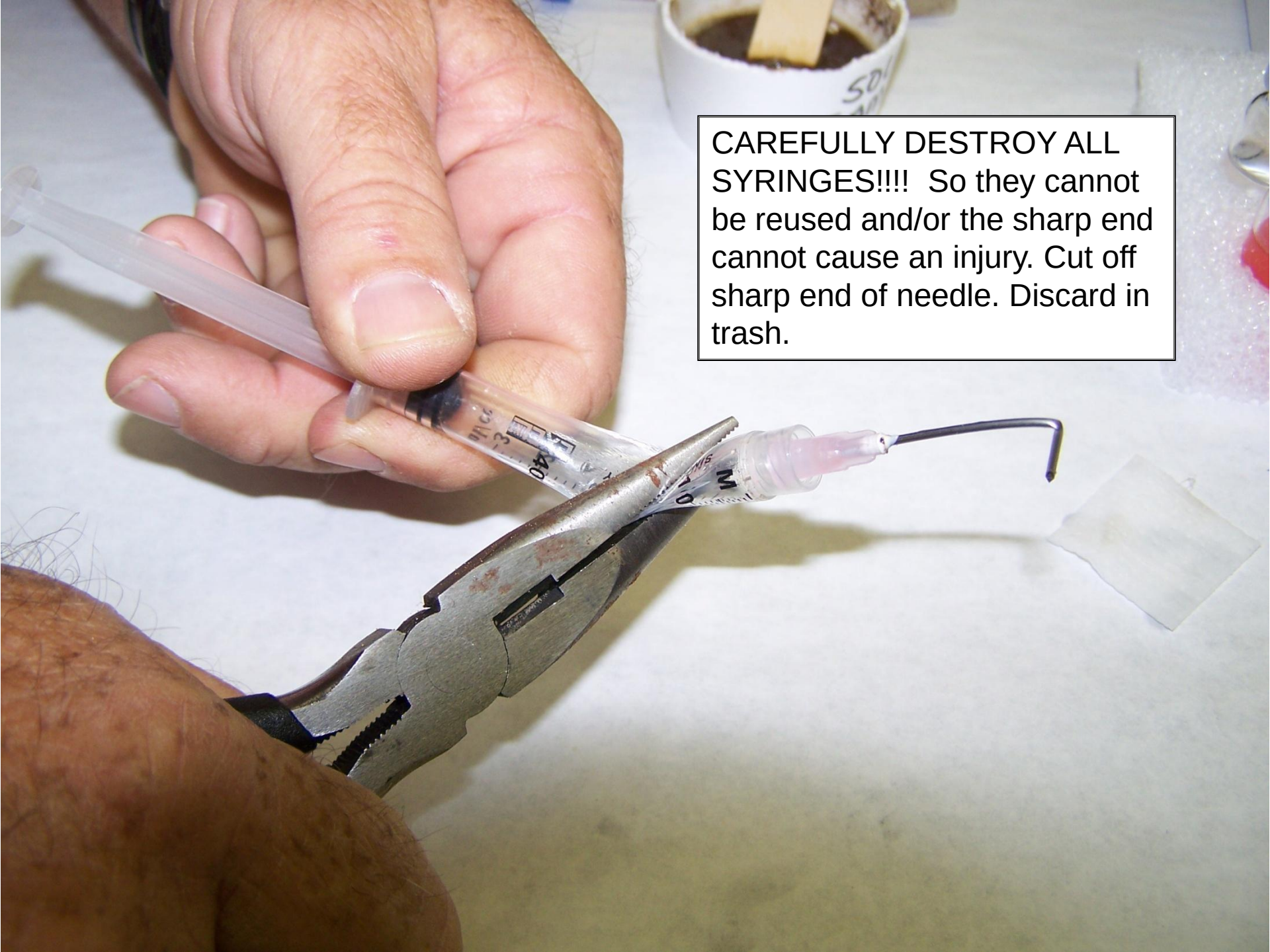
CAREFULLY!! Inoculate the Bacteria Test Kit #5 bottles.

INOCULATION PROCEDURE OF
SOLID-LIQUID SAMPLES FOR
BACTERIA TESTING.docx

NOTE!! When AS RECEIVED, the media for green bottle tops is RED and media for silver bottle tops is clear (often with white precipitate). SRB silver top bottles also have a nail in the bottom of each bottle that will react with the SRB and often turn the media black.



CAREFULLY DESTROY ALL
SYRINGES!!!! So they cannot
be reused and/or the sharp end
cannot cause an injury. Cut off
sharp end of needle. Discard in
trash.



Ft-3
M.S. # 1033-

8-11-09

TEMP. 85°

Tech - Tim MILLER
(Liquid SAMPLE)

Label the Kit box as shown and store at room temperature to allow the bacteria to incubate and grow (if present) for the allocated time duration.

SRB = 28 days minimum

ANA = 5 to 14 days

Interpreting Bacteria Test Results

Anaerobic Acid Producing Bacteria (ANA)

- Incubation period is over in 5 days minimum – 14 days maximum
- Bottles need to be inspected within this time frame of 5 to 14 days after sampling and inoculation
- A positive test result with ANA occurs when the red liquid media turns yellow **RED** to **YELLOW** = POSITIVE
- Bacteria is everywhere so it is not unusual to find a positive result, at least in first bottle
- However, since we don't want to chase the minor presence of bacteria across our system, the bacteria test result becomes "significantly positive" when there are more than 2 bottles turned positive (i.e., 3 or more bottles have turned positive)

Interpreting Bacteria Test Results (continued)

Sulfate Reducing Bacteria (SRB)

- Incubation period is over in 28 days minimum – 35 days maximum
- Bottles need to be inspected within this time frame of 28 to 35 days after sampling and inoculation
- A positive test result with SRB occurs when the white/clear liquid media turns BLACK **WHITE** to BLACK = POSITIVE
- Bacteria is everywhere so it is not unusual to find a positive result, at least in first bottle
- However, since we don't want to chase the minor presence of bacteria across our system, the bacteria test result becomes "significantly positive" when there are more than 2 bottles turned positive (i.e., 3 or more bottles have turned positive)



Water Testing EOPIP

Dip Hydrion Water Test
Paper in liquid/solid sample
to test for presence of water
– if water is present, paper
will turn **purple**

If Hydrion Water
Test Paper
cannot be seen
due to presence
of solids – clean
paper carefully
using alcohol or
DRY cloth





DOCUMENTATION!!!!

No one likes this part – but is VERY important, not just for further analysis but for any DOT/PHMSA Audits

DOCUMENTATION!!!!

1. For the Enhanced Orifice Plate Inspection Form, see your Company Operating Procedures.
2. Photograph showing Orifice Plate capturing relative accumulation of Black Powder and EOP Inspection Form
3. Completed Water and Bacteria Test Report

WATER AND BACTERIA TEST REPORTS - EOPIP

Water and Bacteria Test Reports must be completed for each Enhanced Orifice Plate Inspection

Only need to use **ONE** Kit #5 when testing orifice plates for presence of bacteria and water (as opposed to pigging samples where we need to inoculate THREE Kit #5's)

EOPIP FORM

1. An Enhanced Orifice Plate Inspection Report Form must be completed for EVERY SINGLE Enhanced Orifice Plate Inspection!!
2. Complete the Form in entirety – to best of your ability with data you have (will not have Bacteria Test results until after incubation period of 14 to 28 days!)
3. Place Completed EOPIP Form next to the removed Orifice Plate and take Photograph
4. Label Photograph with Line Name/Input Name/Station Plus/Date

Thank You