



MANU 419

Experimental Setup

By:

Billy Marquez

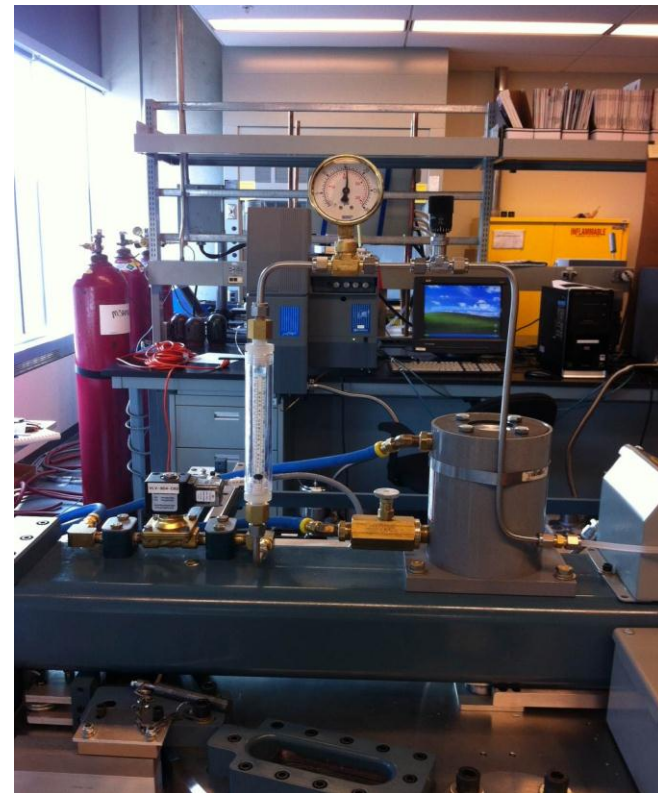
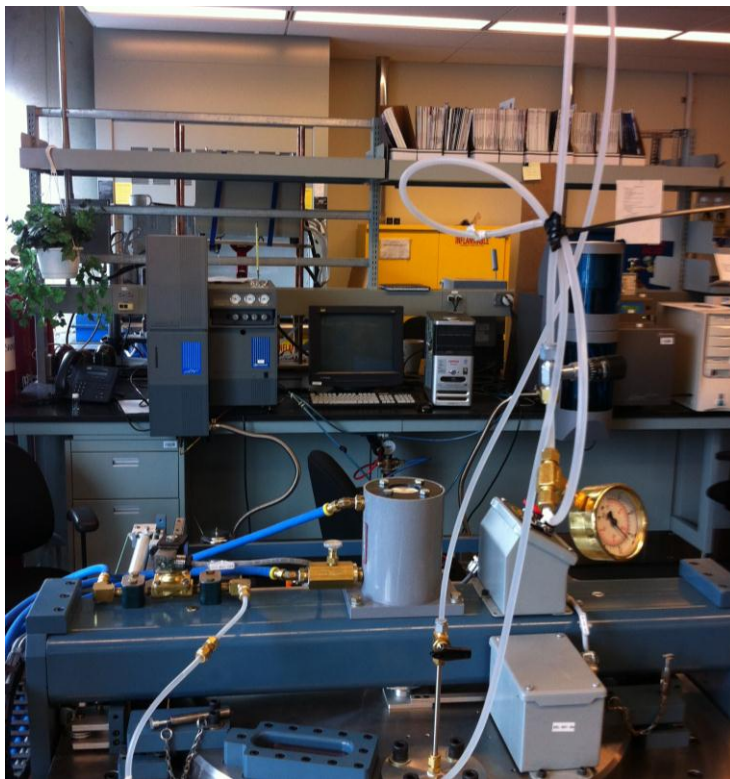
Alfredo Martinez



The Water Erosion Rig

Accomplishments

- New droplet generator system



The Water Erosion Rig

Accomplishments

- New magnetic door switch for safety precaution



The Water Erosion Rig

Accomplishments

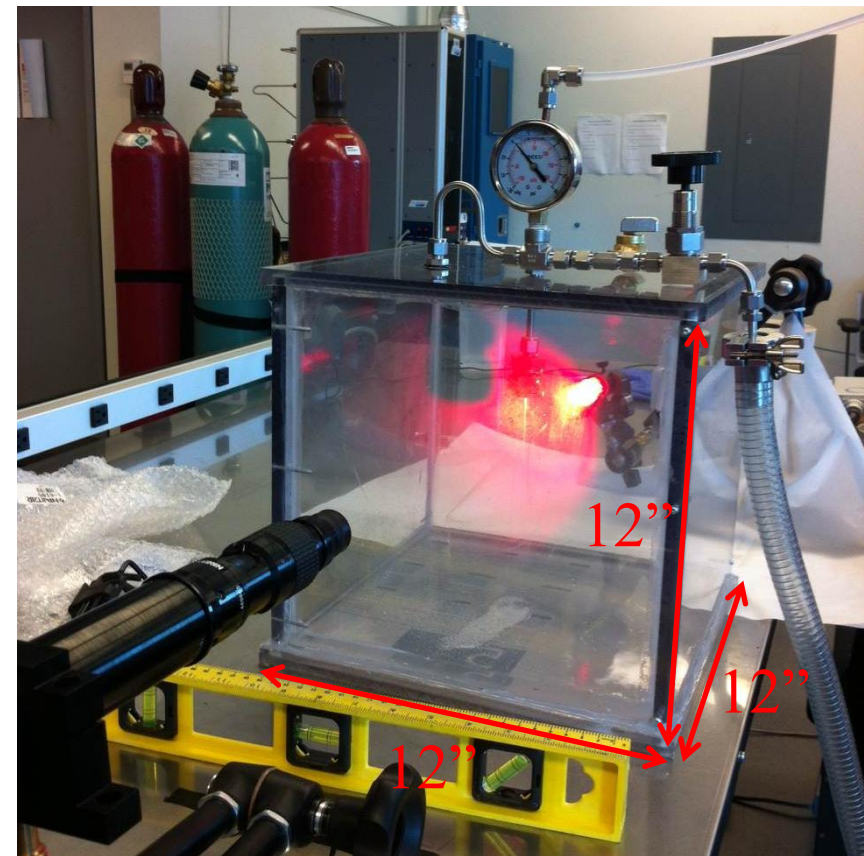
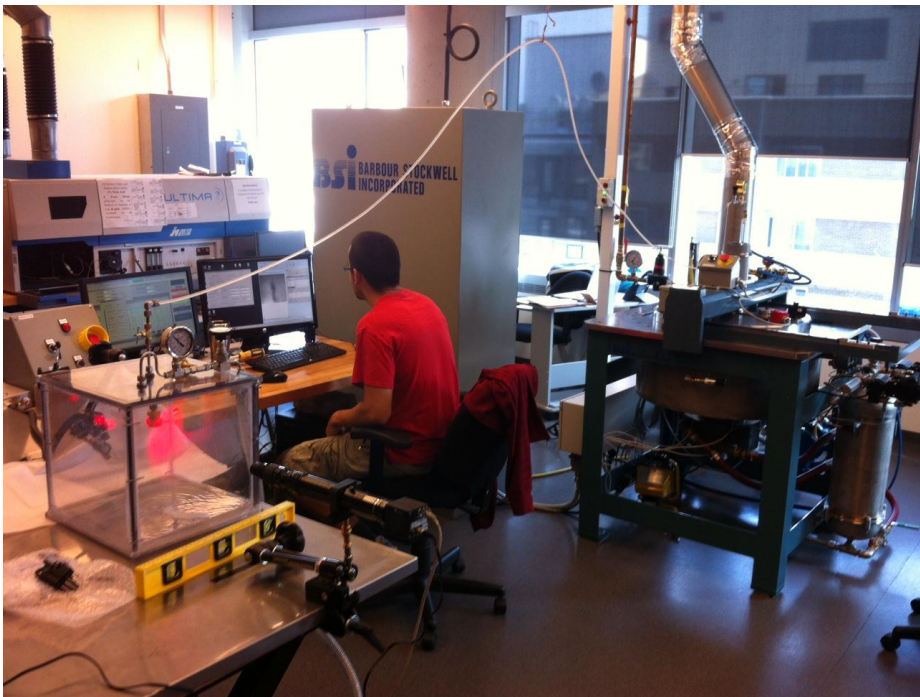
- New water pump filter for droplet system
- Activated Carbon 5 Micron Filter



The Water Erosion Rig

Accomplishments

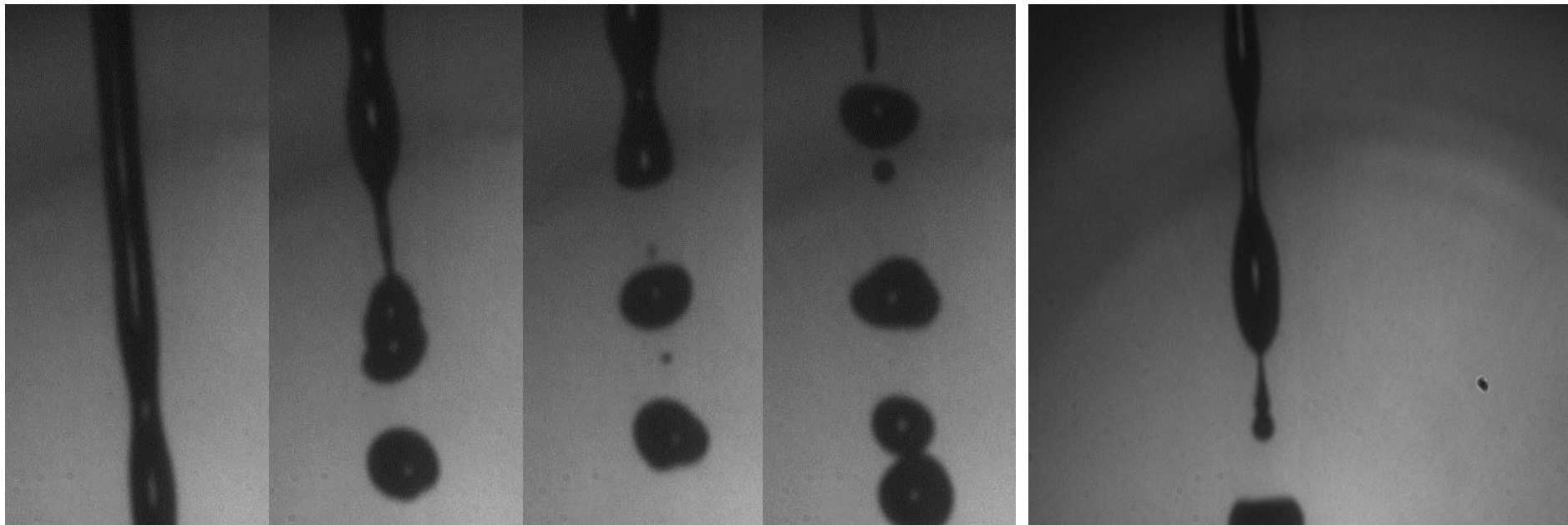
- New Shadowgraphy box able to achieve 47 mbar



The Water Erosion Rig

Accomplishments

- Achieve pictures at different pressures
- Droplets at 49.2 ml/min at atmosphere pressure



The Water Erosion Rig Imaging System Components

- Trigger
- Arduino Uno

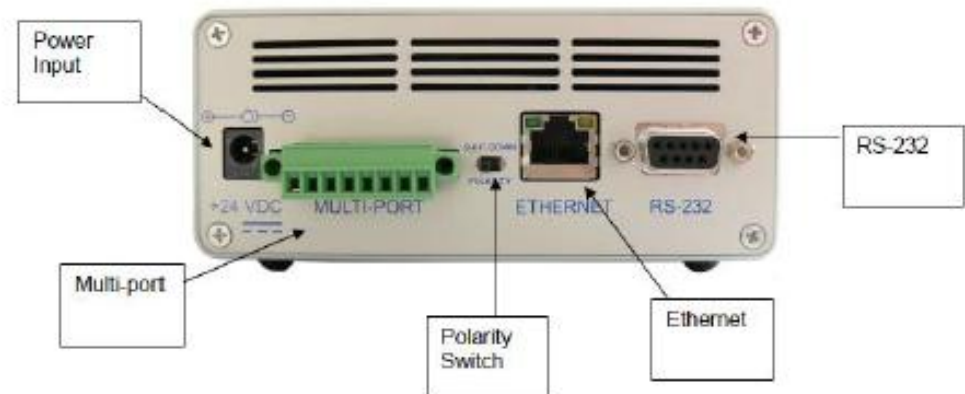
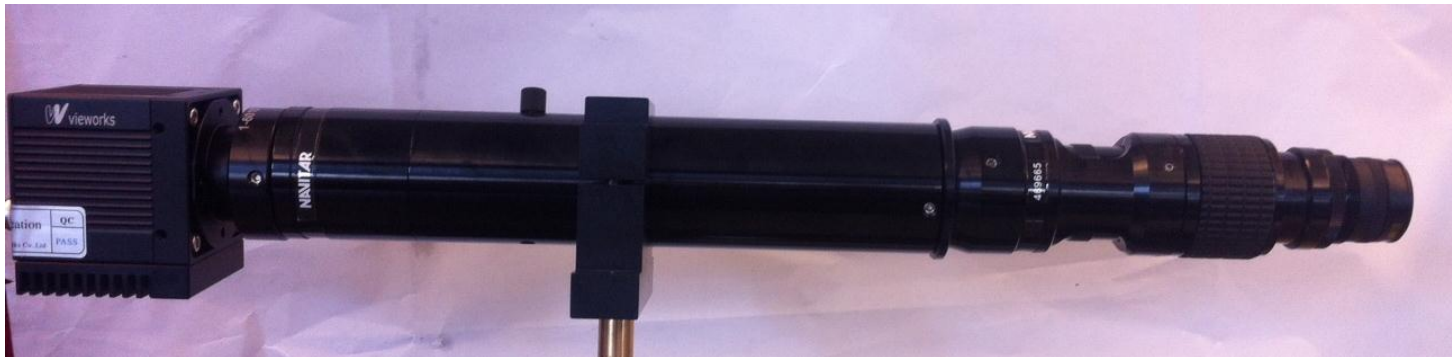


Trigger 12V
step



The Water Erosion Rig Imaging System Components

- High speed camera
- SCHOTT LLS lighting



The Water Erosion Rig Imaging System Software

- Image Processing code for MatLab
- Debugging of Streampix

The Water Erosion Rig

Issues That Require Attention

1. Vacuum Pump – Excess Water Intake



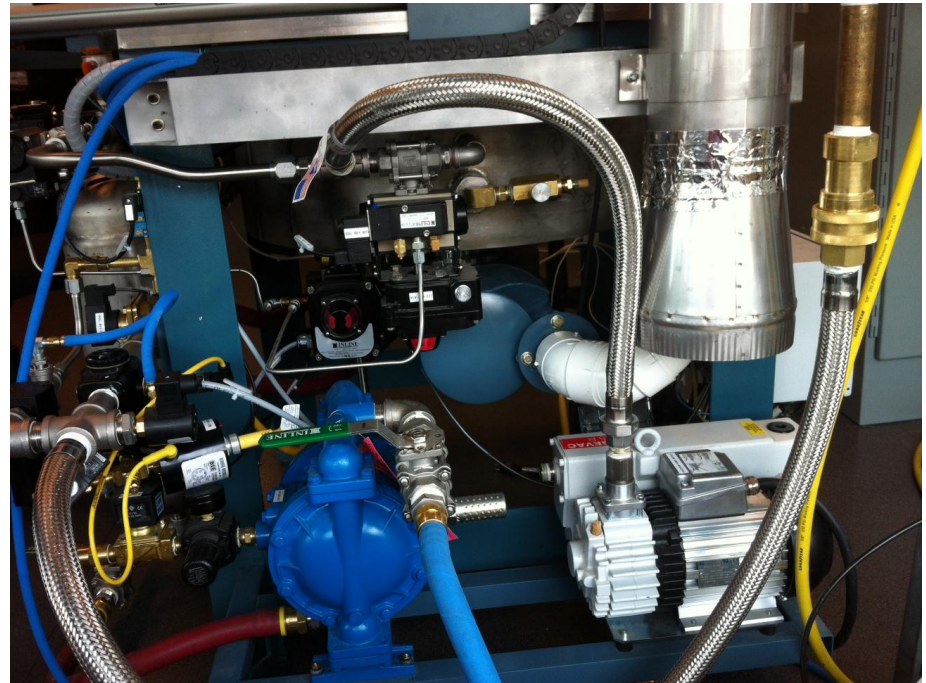
Liquid Traps / Separators



The Water Erosion Rig

Issues That Require Attention

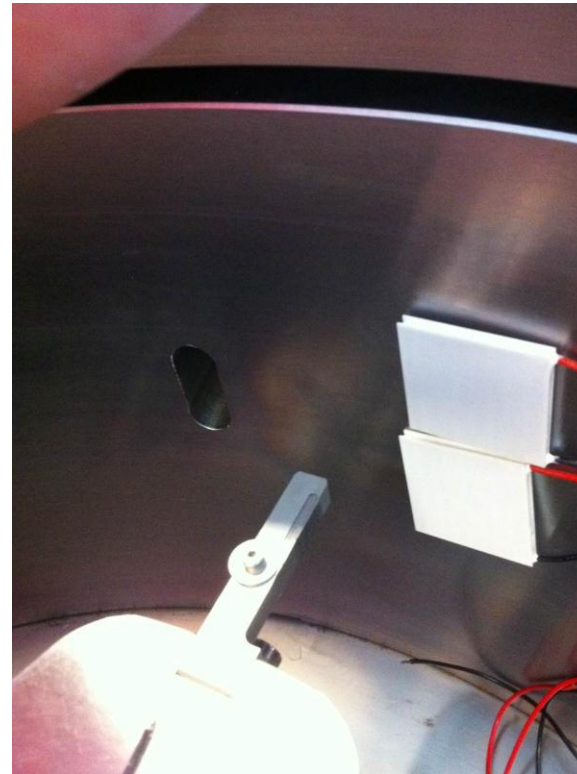
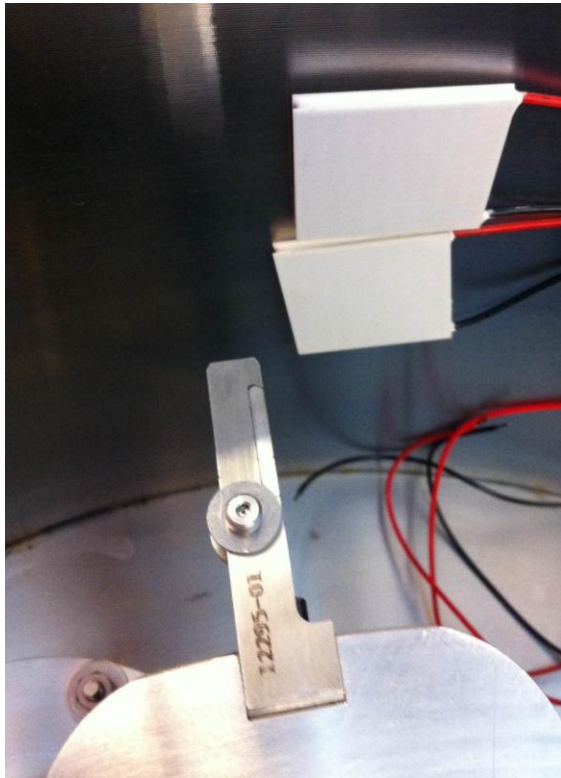
- Can convert the Scavenger Tank into a liquid trap



The Water Erosion Rig

Issues That Require Attention

- Peltier Plates for in chamber vapor condensation



The Water Erosion Rig

Issues That Require Attention

Vacuum Pump Isolation

- Spin III needs to be modified by BSI in order to allow the vacuum pump to run with “Chamber Isolation Valve” in CLOSED position.
- Vacuum pump should be run isolated for 30min prior to running experiments. This allows oil temperature to increase, and subsequently ingested water to be purged from oil.

The Water Erosion Rig

Issues That Require Attention

Max Velocity Issues

- Speeds have been limited due to:
 - Chamber pressure
 - Low air pressure from school intake line
 - Indicated by problems opening scavenger tank valve.
 - Observations of gauges

Turbulence Issue:

- Water jet deflects due to turbulence.



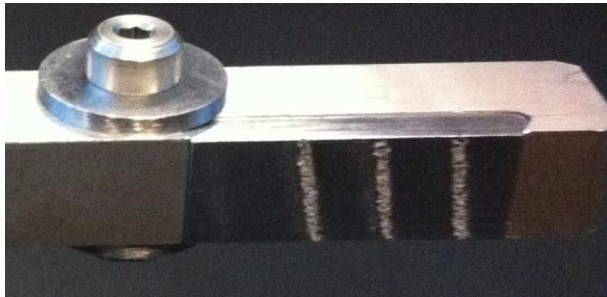
The Water Erosion Rig Experiments

- Low speed coupons ran at 10 000 RPM with a flow rate of 49.2 ml/min
- First test ran at intervals of 20 min for a total of 1 hour
- The 2 samples did not erode evenly

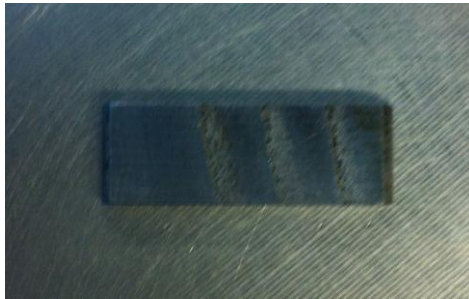
Time	Sample 1 weight loss	Sample 2 weight loss
20 min	0.0234g	0.01g
40 min	0.0353g	0.0179g
60 min	0.058g	0.0352g

The Water Erosion Rig Experiments

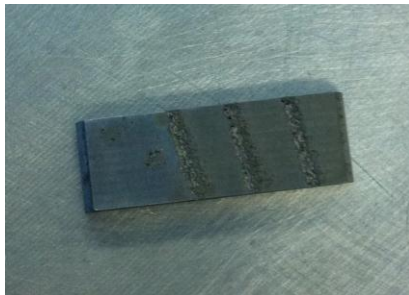
Sample 1



20 min

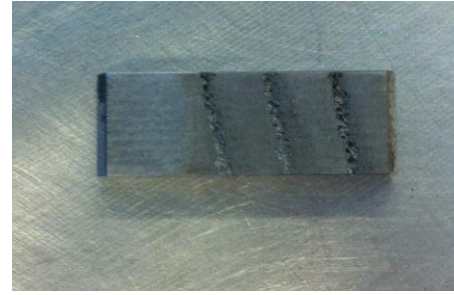
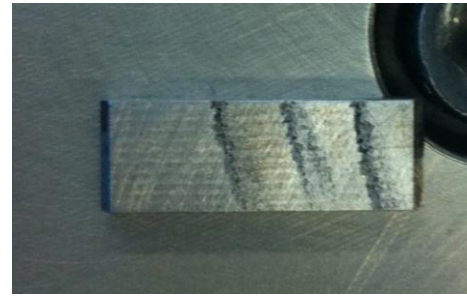
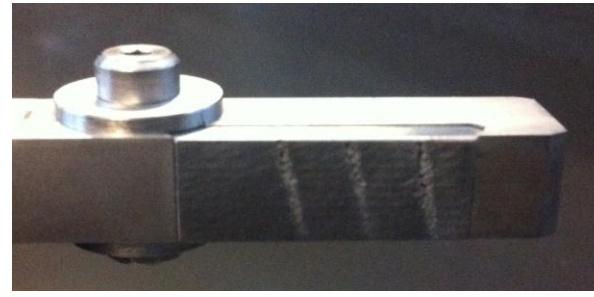


40 min



60 min

Sample 2



The Water Erosion Rig Experiments

- Second Test produced similar results but much less erosion
- Speed 10 000 RPM at a flow rate of 24.6 ml/min

Time	Sample 1 weight loss	Sample 2 weight loss
20 min	0.0007g	0.0017g
40 min	0.001g	0.0036g
70 min	0.005g	0.0139g

The Water Erosion Rig Experiments

Sample 1



20 min

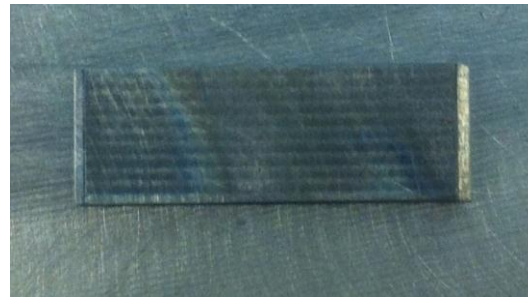


40 min



70 min

Sample 2



Thank you



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