OPTICAL MASS FLOW METER

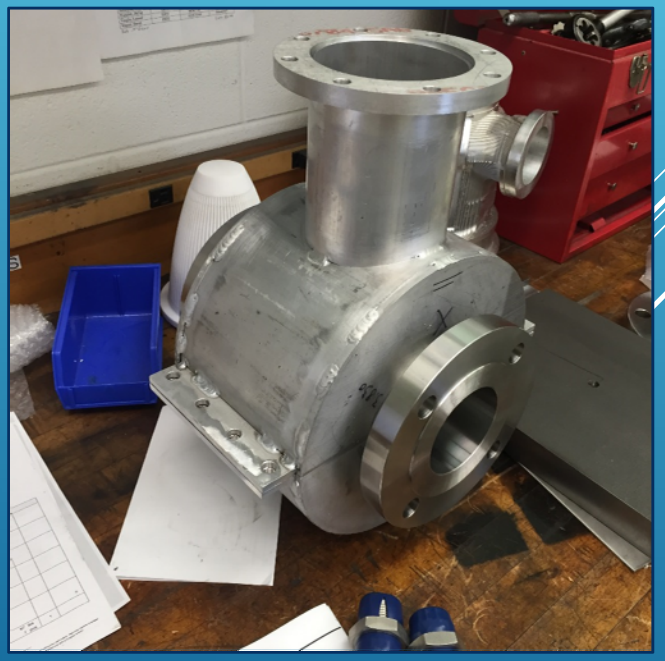
Maegan Dawson

NASA MSFC

August 2017

WHAT IS AN OPTICAL MASS FLOW METER?

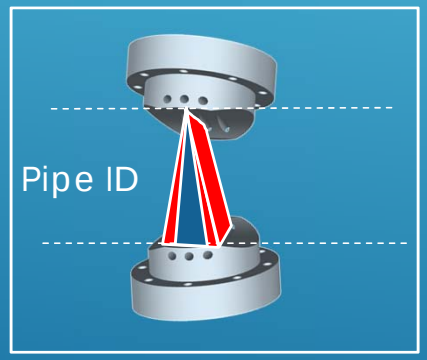
- A device that uses 2 unique lasers to determine the density of a multi-phase, multi-media substance flowing through a fluid path
- Provides flow characterization for seamless understanding of what is happening inside a flow path
- Potential to change engine development

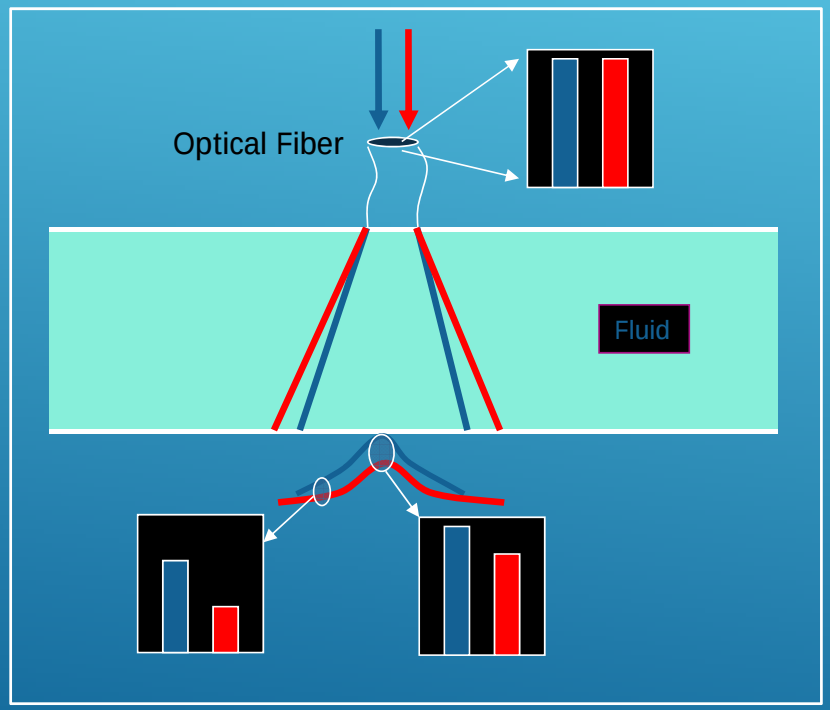


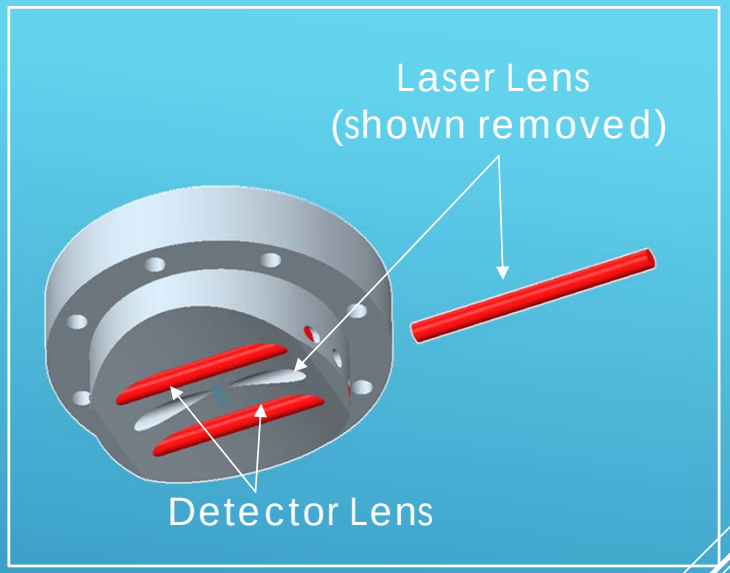
WHY IS IT IMPORTANT?

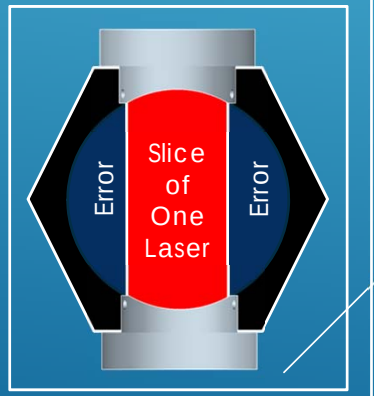
- Specifically, KSC needs to know the amount of LH2 sent to the flare stack when chilling and operating SLS engines
- Rocket Engine Development would be transformed with the development of this technology
- Engine models would no longer be a guess, rather a specific instrument for engine operation

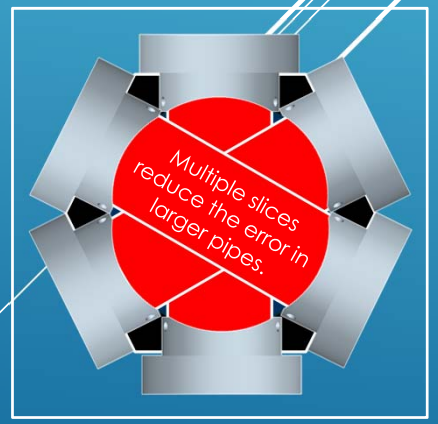
THE TECHNOLOGY



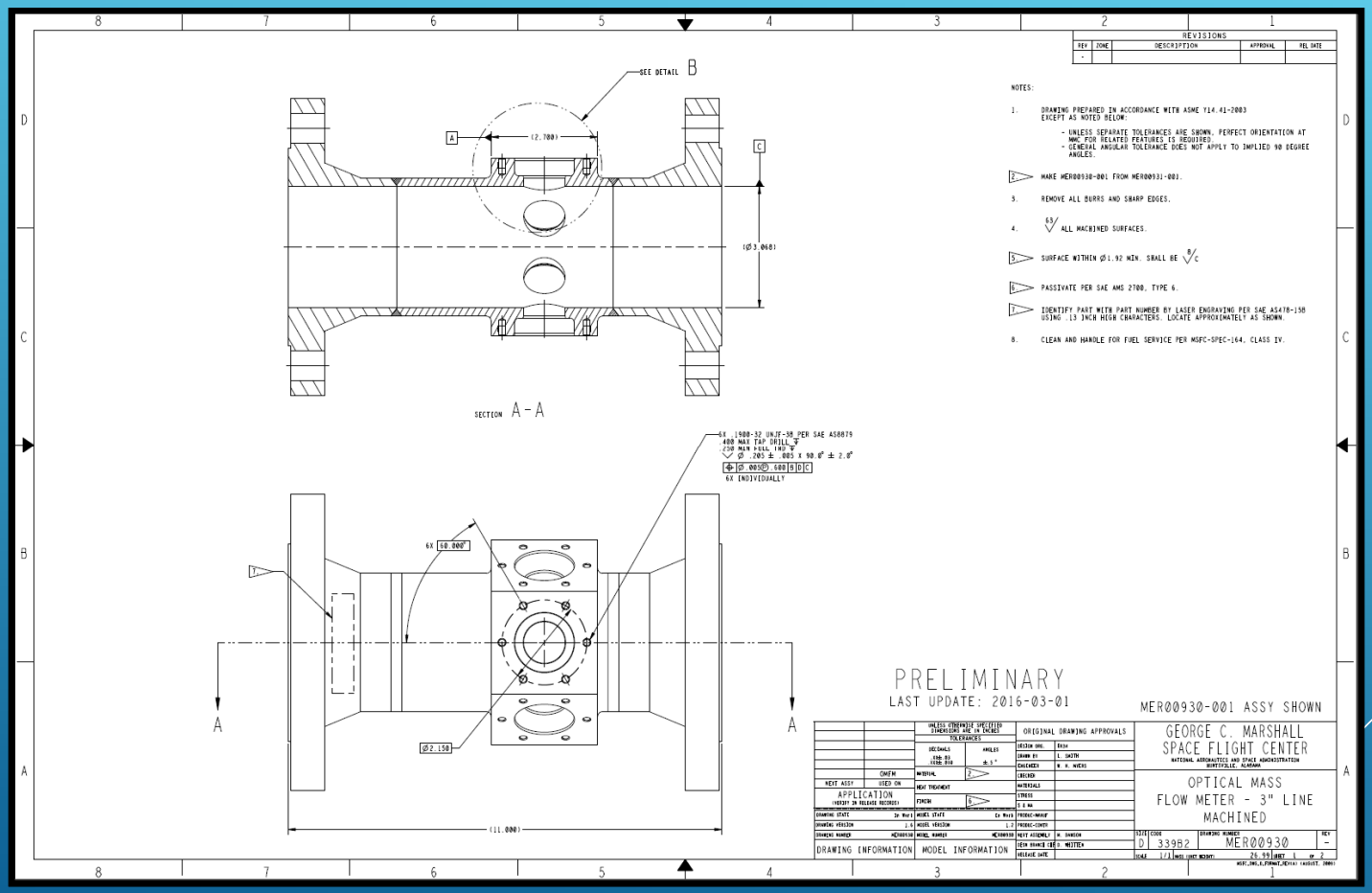




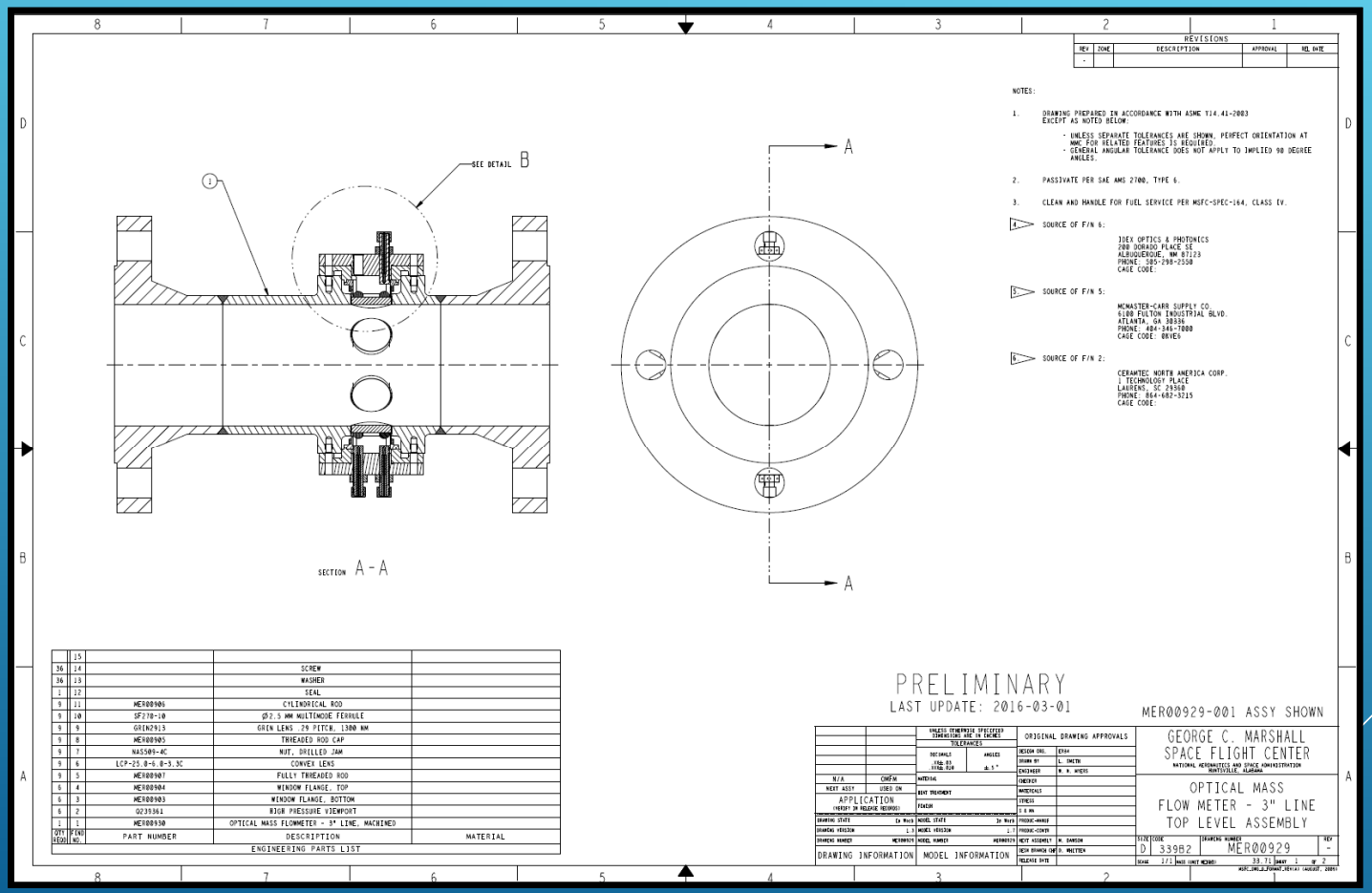




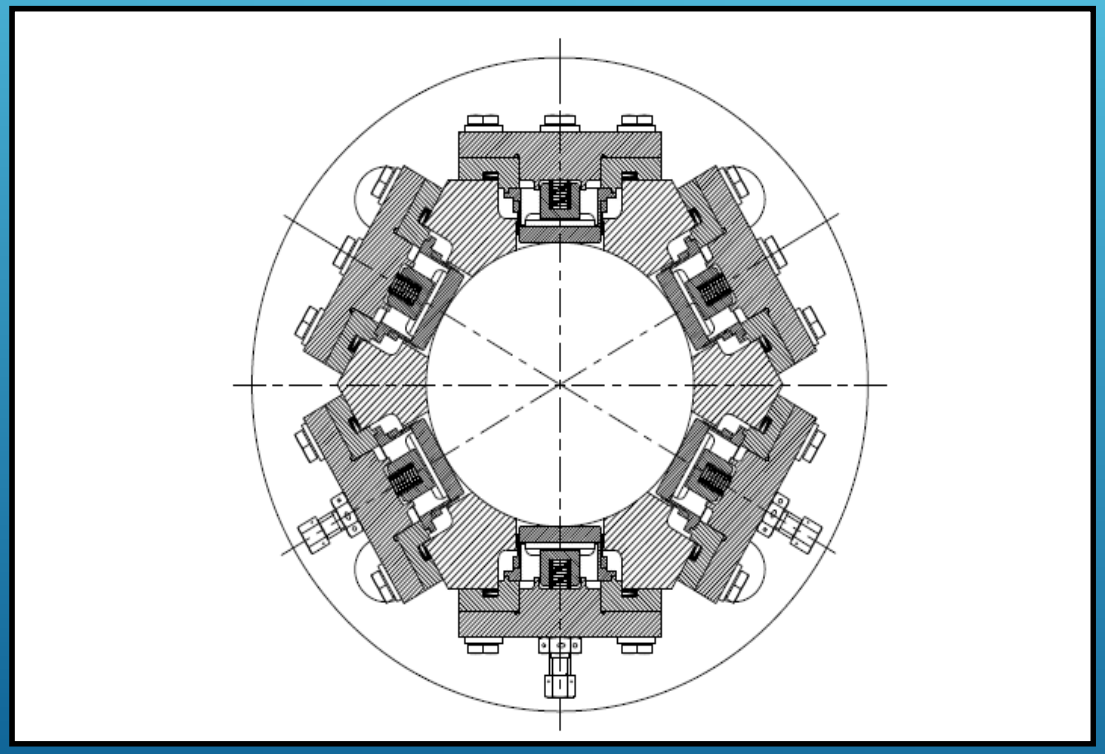
THE BODY DESIGN



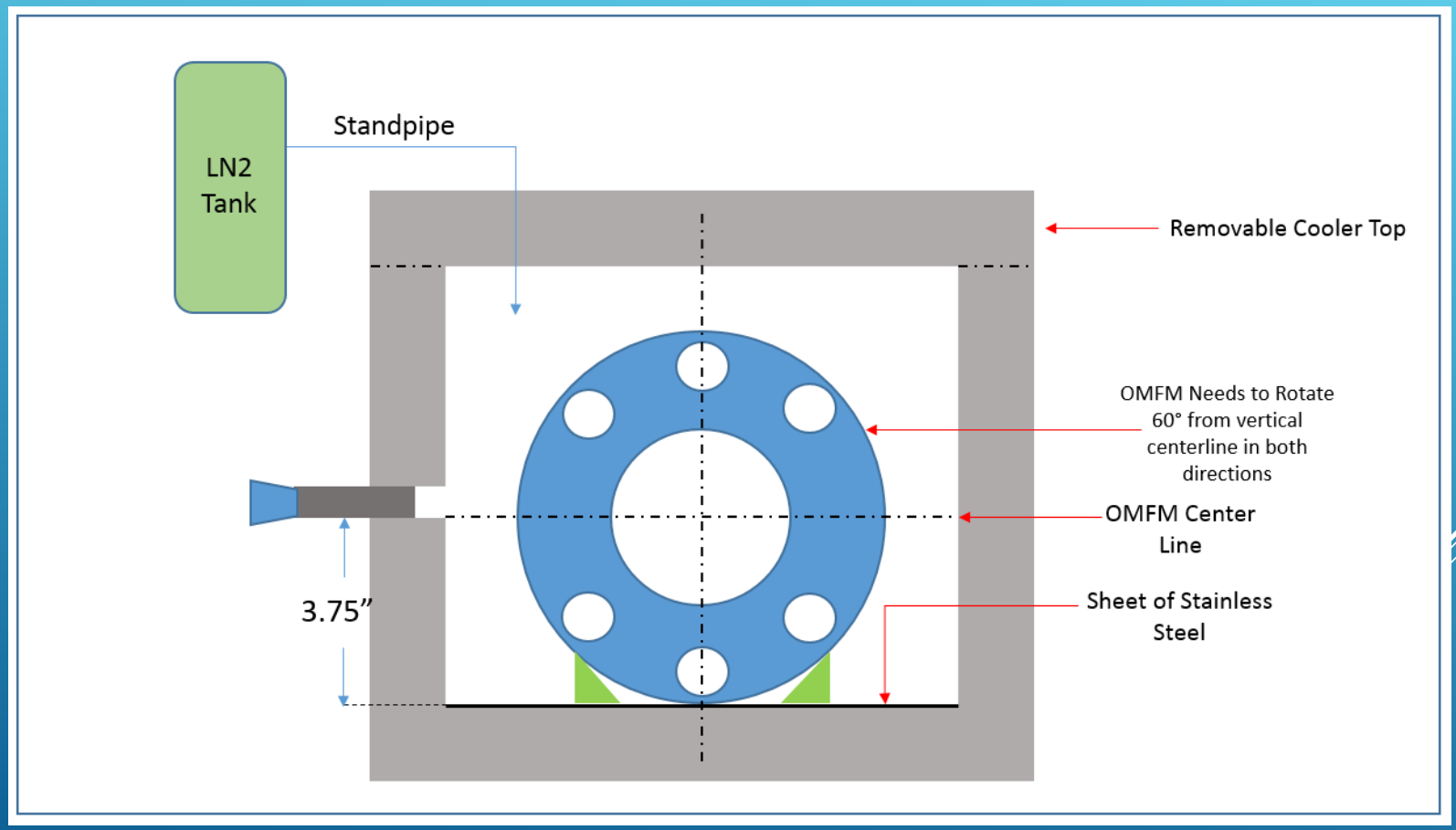
THE BODY DESIGN CONTINUED



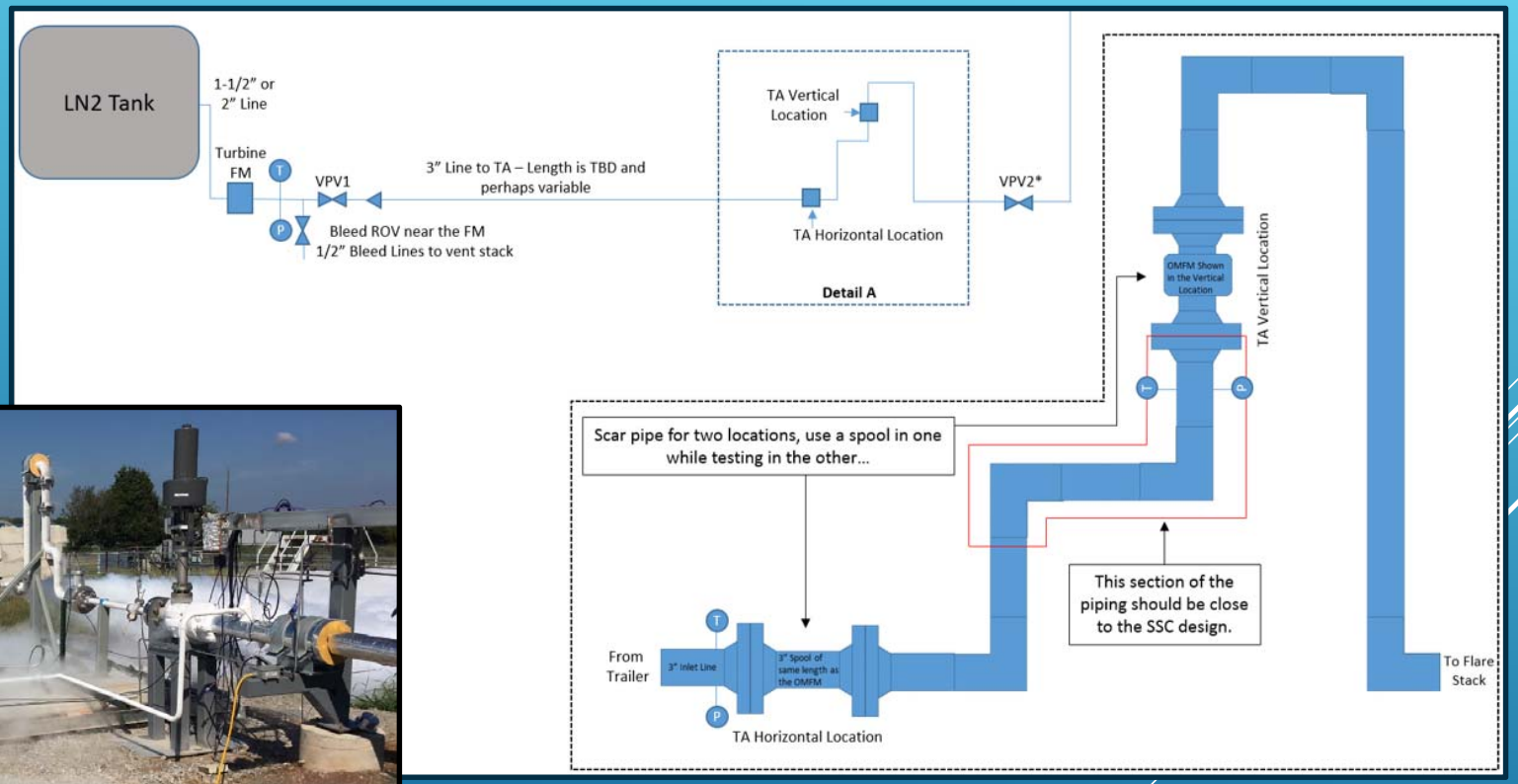
CAP DESIGN



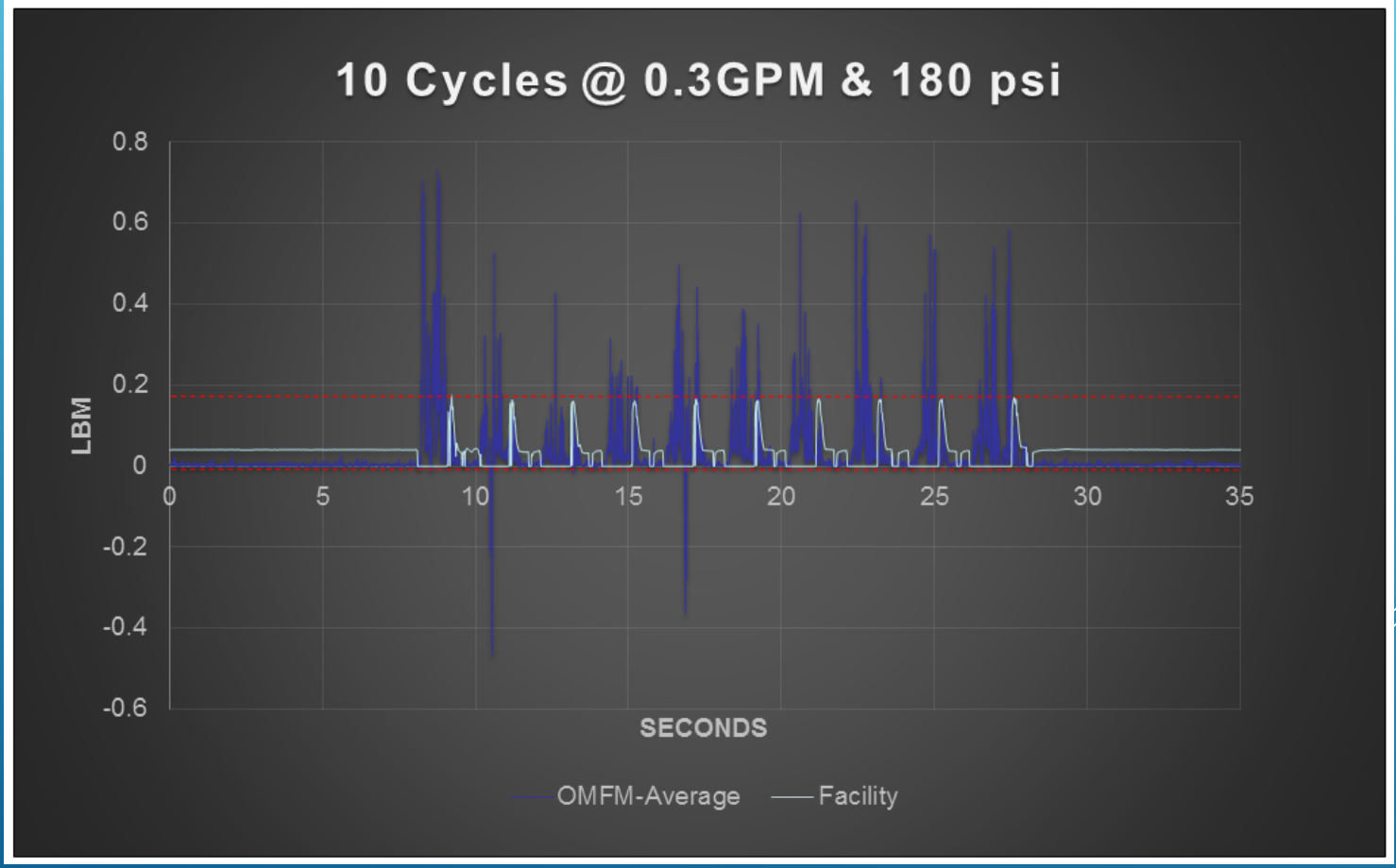
CONFIGURATION TESTING



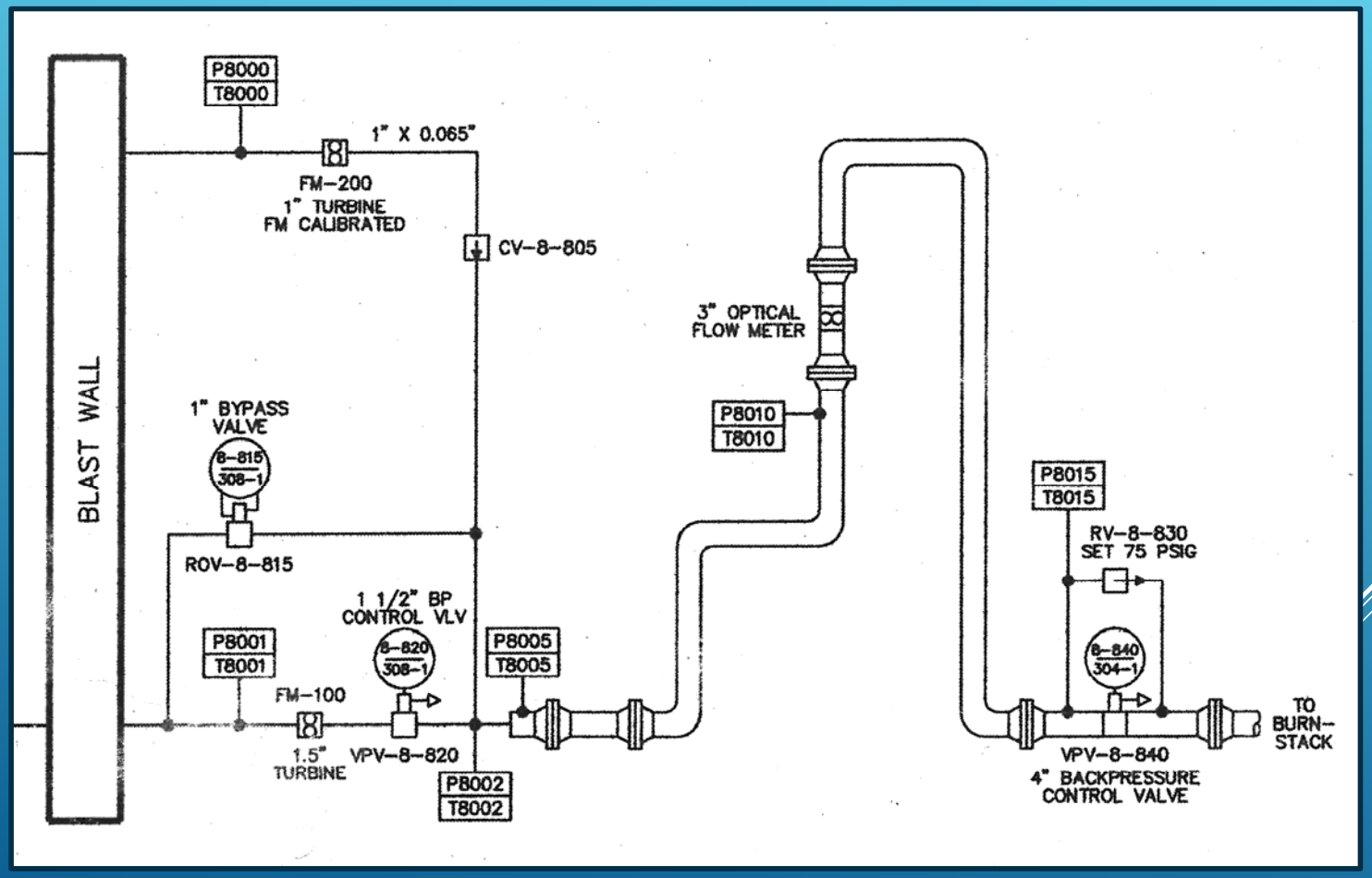
LN2 TEST


LN2 Tank
1-1/2" or 2" Line
Turbine FM
VPV1
3" Line to TA – Length is TBD and perhaps variable
Bleed ROV near the FM
1/2" Bleed Lines to vent stack
TA Vertical Location
TA Horizontal Location
VPV2*
Detail A
OMFM Shown in the Vertical Location
TA Vertical Location
Scar pipe for two locations, use a spool in one while testing in the other...
This section of the piping should be close to the SSC design.
From Trailer
3" Inlet Line
3" Spool of same length as the OMFM
TA Horizontal Location
To Flare Stack

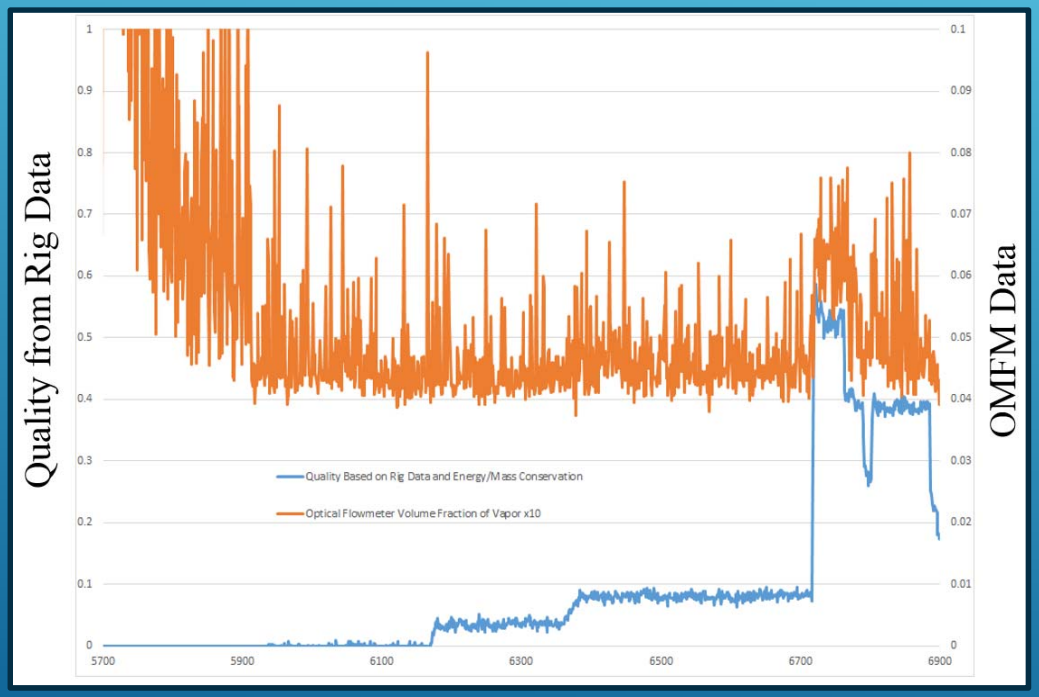
LN2 RESULTS

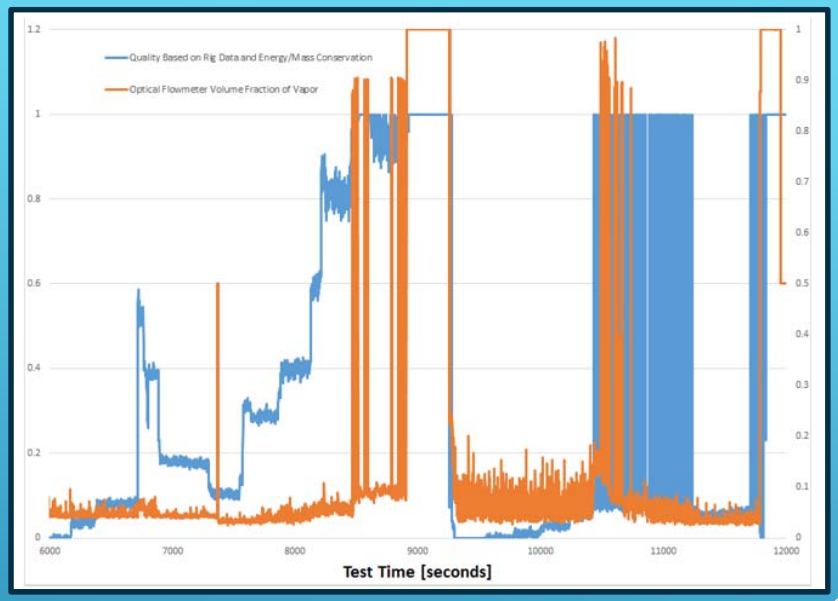

10 Cycles @ 0.3GPM & 180 psi
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
LBM
0
5
10
15
20
25
30
35
SECONDS
OMFM-Average
Facility

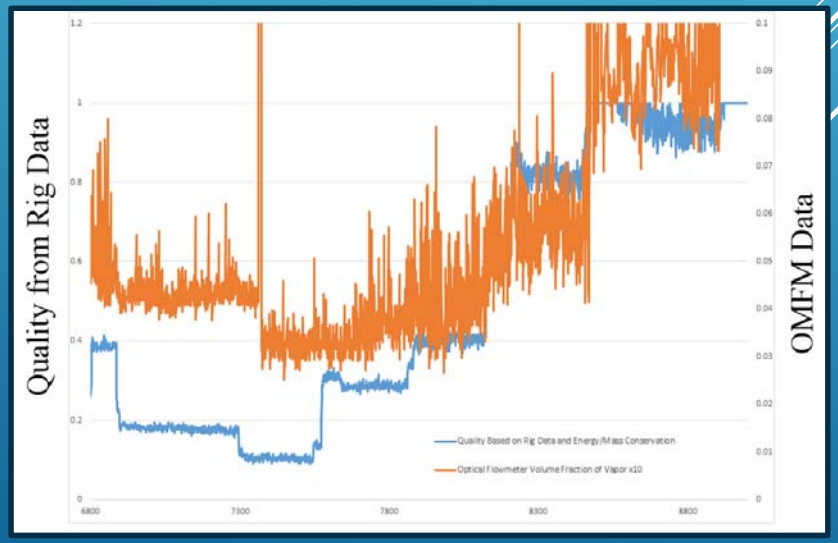
LH2 TESTING


BLAST WALL
P8000
T8000
1" X 0.065"
FM-200
1" TURBINE
FM CALIBRATED
CV-8-805
3" OPTICAL
FLOW METER
1" BYPASS
VALVE
8-815
308-1
ROV-8-815
P8010
T8010
P8015
T8015
RV-8-830
SET 75 PSIG
1 1/2" BP
CONTROL VLV
8-820
308-1
P8001
T8001
FM-100
P8005
T8005
8-840
304-1
TO
BURN-
STACK
1.5"
TURBINE
VPV-8-820
P8002
T8002
VPV-8-840
4" BACKPRESSURE
CONTROL VALVE

LH2 RESULTS


Quality from Rig Data
OMFM Data
Quality Based on Rig Data and Energy/Mass Conservation
Optical Flowmeter Volume Fraction of Vapor x10


Quality Based on Rig Data and Energy/Mass Conservation
Optical Flowmeter Volume Fraction of Vapor
Test Time [seconds]


Quality from Rig Data
OMFM Data
Quality Based on Rig Data and Energy/Mass Conservation
Optical Flowmeter Volume Fraction of Vapor x10

COMMENTS & QUESTIONS?