Electronic Liner Measurement Report

Job ID: 18-xxx

0. Vessel/Job data

Vessel:	Vessel 2	Location:	Port Lemoin
Engine Type:	7RTA72	Job date:	
Engine ID:	☺	Service Engineer:	
Running hours:	87.496	Job order by:	

1. Service scope - work done

a) measurement of all cylinder liner wear
b) measurement of piston ring coating thickness
c) camera based visual liner inspection

2. Liner wear analysis

~ liner general
The observed patterns are very variable and generally not in line with normal RT engine wear patterns.
The ovality of the liners is well within limits except liners 1 & 6

 ~ liner L1
The wear rate is normal but the wear pattern is unusual. Fwd direction (0°) shows low wear, usually a sign of excessive lubrication and a local peak, normally associated with a scratch. (Possibly protruding lub oil injector) – blue arrow. Monitoring recommended
In way of fuel injectors wear is low while above and below wear is high. Normal wear pattern is opposite like this. (see liner 2). We recommend to check the lub oil injection timing.
The maximum wear is not at the top piston ring (marked in grey) but lower. That is a sign for gas passage. (red arrow). We recommend to exchange the piston rings to increase sealing.
The high ovality may increase loads on piston rings and wear in piston ring grooves. We recommend to monitor the development.

 ~ liner L2, L5 & L7
The wear rate is normal but the wear pattern is indicating increase wear in lower part.
All piston rings are leaking gas (red arrow). The gas mixing with lub oil may reduce lubrication thus increase wear. Only L7 shows some improved sealing in 270° direction.
We recommend to exchange the piston rings and monitor the development.
The wear is increasing above the lub oil injectors while it should be reduced under normal circumstances. We recommend to check the lub oil injection timing and quantity. The injectors should be checked for blockage and proper function.
The wear has reached 75% of recommend limits. We recommend to monitor the development.

 ~ liner L3
The wear rate is normal but the wear pattern is indicating high wear in lower part.
All piston rings are leaking gas (red arrow) and the oil rings on piston skirt appear to be sealing only. The gas mixing with lub oil may reduce lubrication thus increase wear.
We recommend to exchange the piston rings and monitor the development.
The liner wear is approaching recommend limits. We recommend to prepare to exchange the liner.

 ~ liner L4
The wear rate is normal but the wear pattern is indicating increase wear in lower part.
All piston rings are leaking gas (red arrow). The gas mixing with lub oil may reduce lubrication thus increase wear.
We recommend to exchange the piston rings and monitor the development.
The wear is increasing above the lub oil injectors while it should be reduced under normal circumstances. We recommend to check the lub oil injection timing and quantity. The injectors should be checked for blockage and proper function.
The liner shows strong mechanical damages in mid stroke area – yellow arrows. Damage depth is is up to 0.6mm. Considering the total wear pattern with gas leaks mechanical damages, we recommend to hone the liners at next possibility.

 ~ liner L6
The wear and ovality is beyond recommended limits.
The top piston ring shows improved sealing – green arrow.
We recommend to exchange the liner.

 ~ liner L7
The wear pattern is that of a new liner. In way of the lower lub oil injection port the liner is protruding inward by about 0,1mm (yellow arrow), normally a sign of local mechanical damage corrected by grinding. This is considered uncritical, the pictures in range do not show any abnormal wear, although they do not cover the injector in question (PS injector/maneuver side).

3. Liner wear trend analysis
No previous data available.

4. Piston ring measurements

~ piston rings general
The piston ring distribution is unequal and no distinct pattern is visible.

 ~ cylinder 1 to 5
All piston rings are leaking gas and the liners show increased wear.
We recommend to install gas tight, coated piston rings in "T" and preferably also "B" position to improve gas sealing and lub oil distribution.
The piston rings on cylinders 1 to 3 show sharp edges thus are not able to distribute oil anymore.

 ~ cylinder 6 & 7
Top rings are well coated and show round edges. We recommend to monitor the development.

5. Piston ring trend analysis
No previous data available.

6. Piston ring Inspection
No data available.

7. Digital Liner Inspection

Picture were taken with double lens camera system HorizonV1, therefore two sets of pictures per liner are available. Camera C1 is pointed at the liner wall in aft (180°) direction while camera C2 is pointed vertically upward to focus on cylinder cover items.

~ general impression

Soot deposits:	high (due to high soot, light conditions in liner are poor)
Carbon deposits:	medium
Lubricator grooves & injectors:	clear & intact
Starting air valve:	clear, no cracks
Exhaust valves:	low deposits, intact, no pitting
Exhaust valve seats:	visible – see comments
Fuel injectors:	covered in deposits
Wave cut/honing pattern:	visible

 ~ liner L1

Scoring marks along the liner surface. Monitor recommended.
Partly blocked fuel injection nozzle – cleaning recommended.

 ~ liner L2 & L3

Fuel injector with massive deposits - cleaning recommended.
Deposits on exhaust valve seat – cleaning recommended.

 ~ liner L4

Scattered scorings marks.
Partly blocked fuel injection nozzle – cleaning recommended.
Deposits on exhaust valve seat – cleaning recommended.

 ~ liner L6

Leaking fuel oil injector – overhaul recommended.

 ~ liner L7

Deposits on exhaust valve seat – cleaning recommended.

Report created on 07th December 2017

Appendix 1 – Action lights definition
Appendix 2 – 3D-Liner Views

Appendix 1

Action lights definition

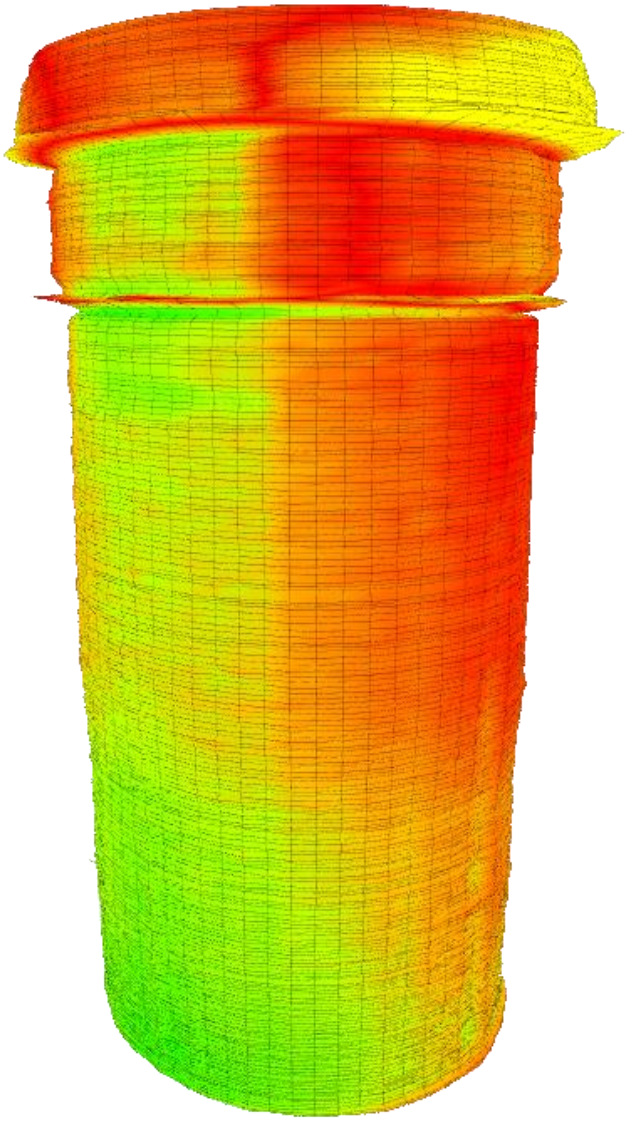

Normal monitoring (12 month) recommended


Action within next 6 month recommended

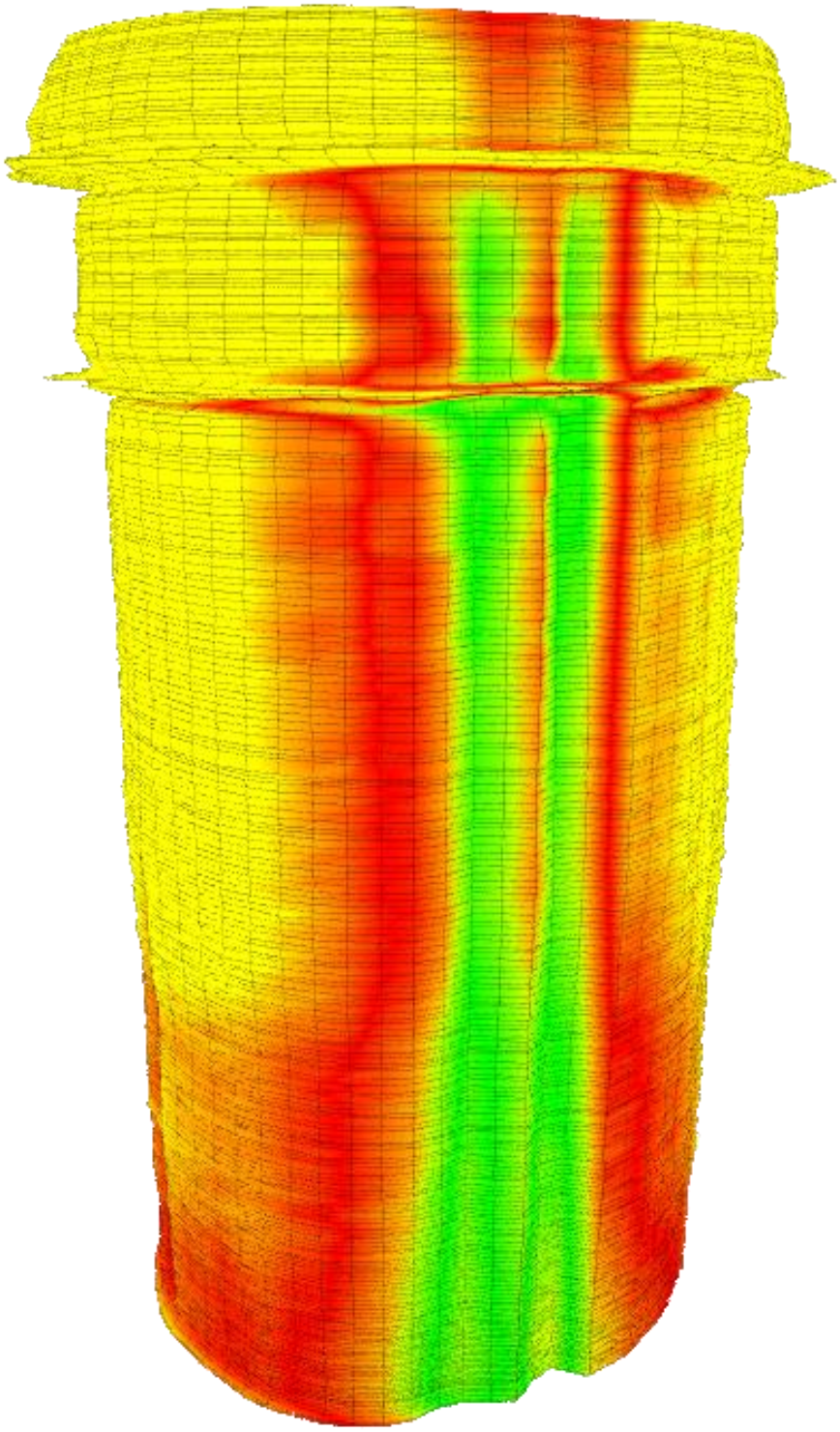

Action within next 3 month recommended


Action recommended

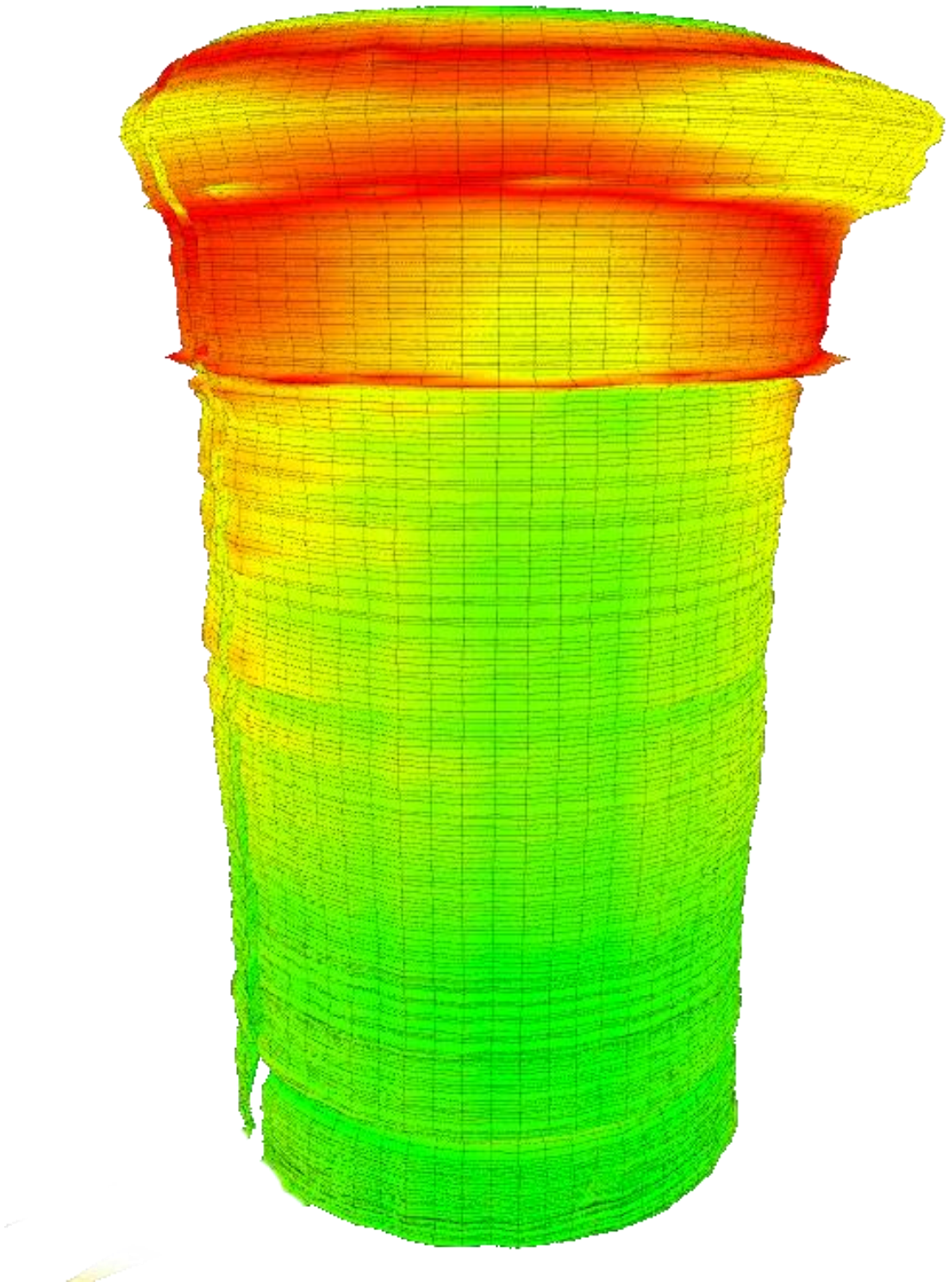
3D Liner Views



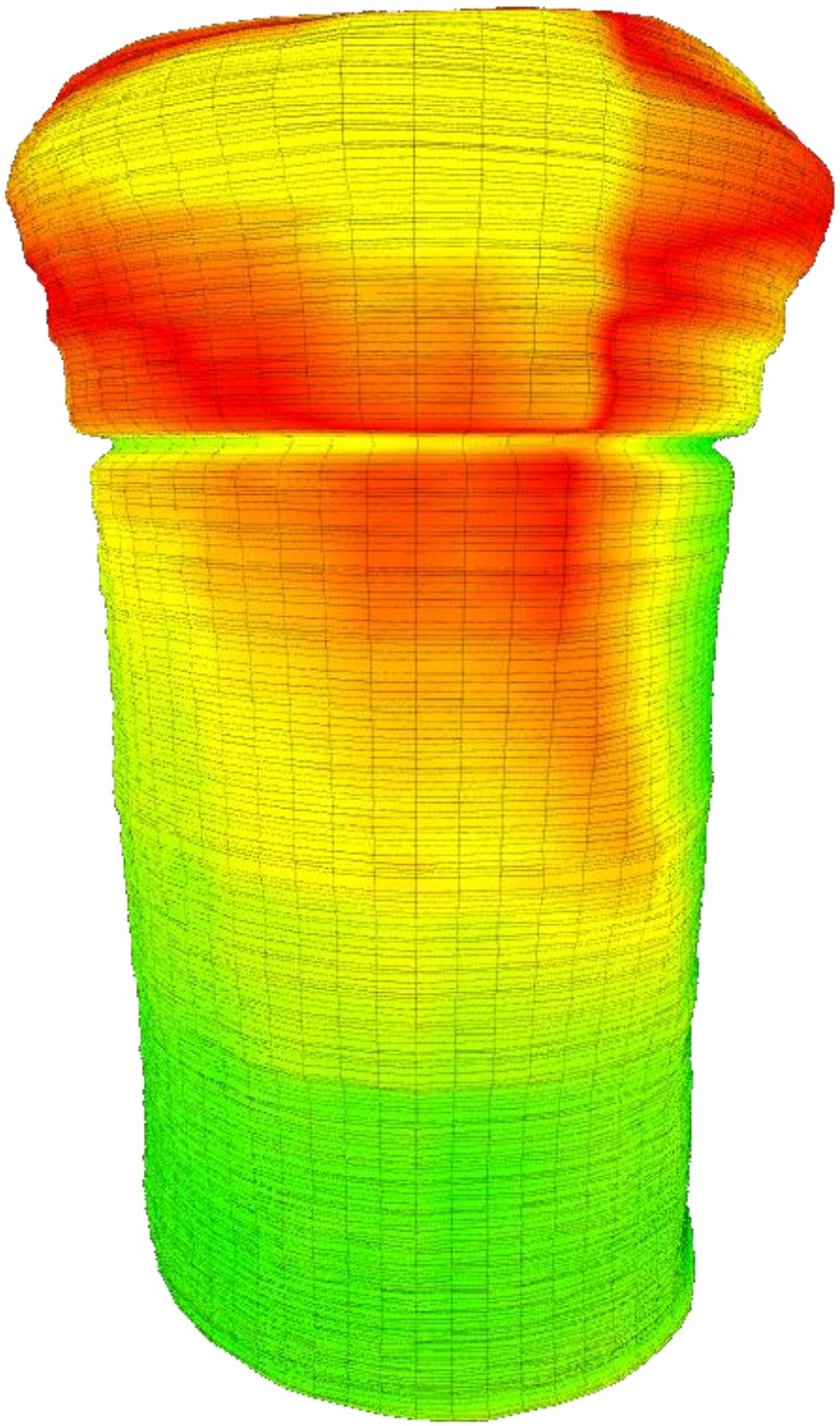
Liner 1



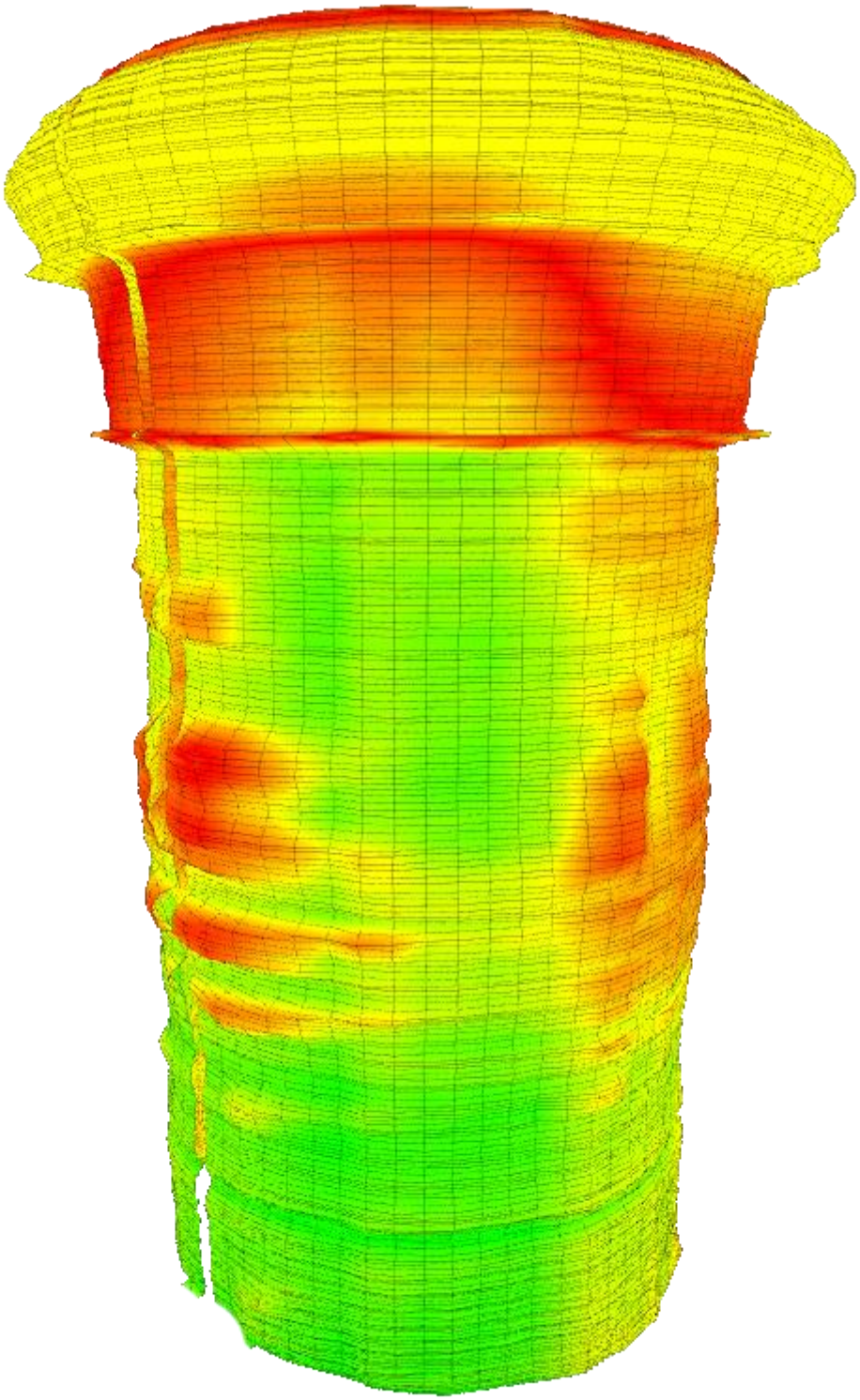
Liner 1



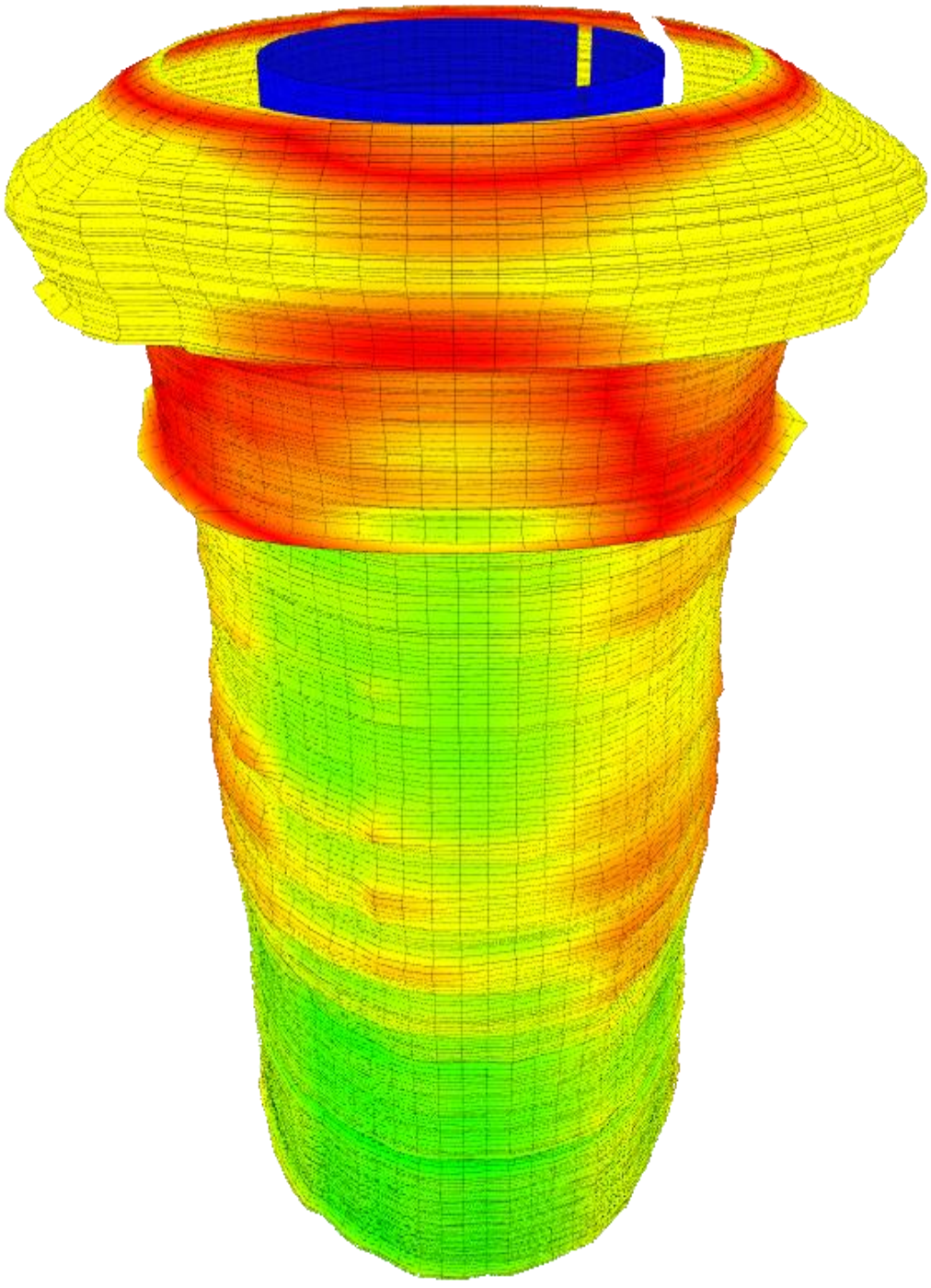
Liner 2



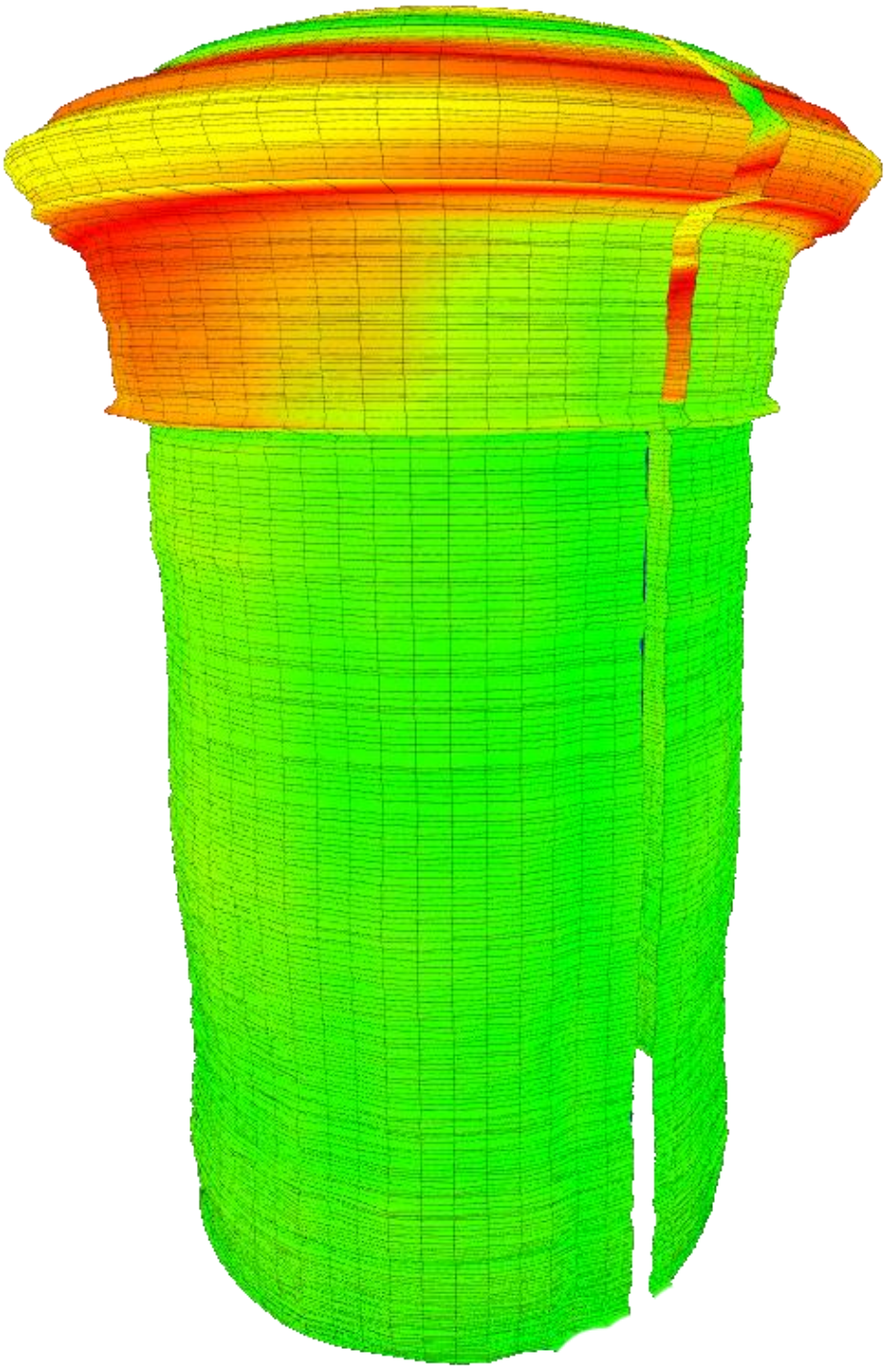
Liner 3



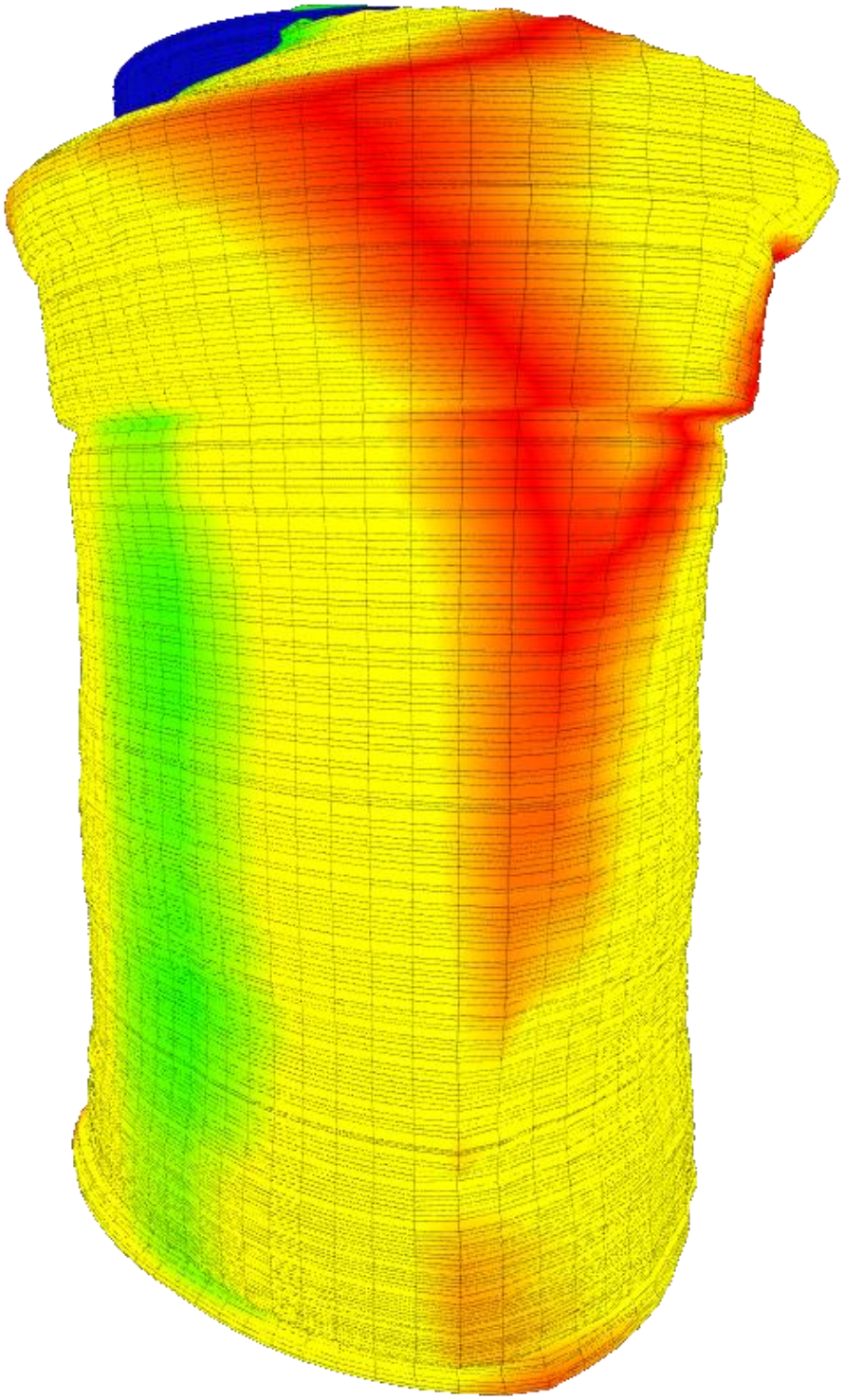
Liner 4



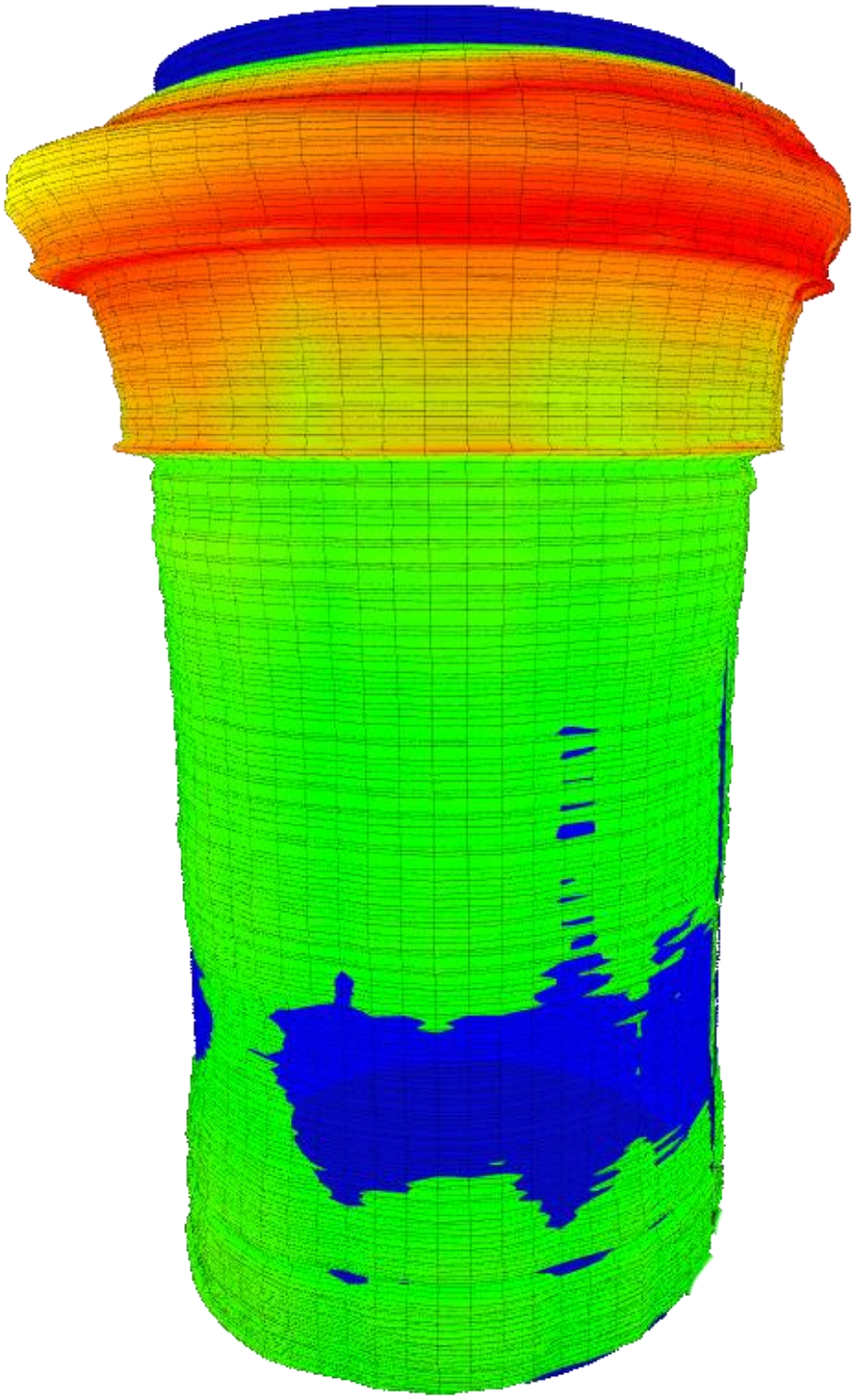
Liner 4



Liner 5



Liner 6



Liner 7