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LAMPIRAN

Lampiran 1 Data Mesin Kapal Tugboat

Existing Main Engine MITSUBISHI S6A3-MPTK – 600 HP

Propulsion - IMO Tier I / Non Emission
High Speed

S6A3-MPTK



6-cylinder, 4-cycle, Water cooled, Diesel Engine
Direct-injection, Turbocharged with Air-cooler.

Bore x Stroke (mm) : 150 x 175
Displacement (L) : 18.56

Commercial Rating

LW	BHP	RPM	Rating	Fuel Cons. L/hr*	Emission
405	543	1,840	UCD	69.8	IMO-T1
445	597	1,900	HD	78.3	IMO-T1
490	657	1,960	MD	85.9	IMO-T1

*Average fuel consumption according to ISO, see page 6.
Specifications/data subject to change without prior notice.

Product Dimensions & Dry Weight

L (mm) : 2,037
W (mm) : 927
H (mm) : 1,371
Dry Weight (kg) : 1,900

Dimensions and Weight are based on standard configuration.

MITSUBISHI MARINE ENGINE

Proposal Mesin Pengganti

Yanmar 6AYM-ETE - 829 HP x 2 UNIT

SPECIFICATION:

Number of cylinders 6 inline

Bore x stroke (mm) 155 x 180

Displacement (litre) 20.379

Rated output (kW)(hp)/rpm) M: 610(829)/1900

Combustion system Direct injection

Aspiration Turbo charger + intercooler

Starting system Electric starting motor (24v 7.0kW)

Cooling system Heat exchanger

Dry mass (kg) 2365

Lampiran 2 Data Propeller kapal Tugboat

PT. ASIA FOUNDRY & ENGINEERING

Jl. Brigjend Katamsa KM18, Tanjung Uncang

Batam - Indonesia

Tel : (62) 778 319531 Fax : (62) 778 391222

e-mail : asiafoundry@pacific.net.sg

PROJECT	: 25M T.S.TUG	JOB NO	: B0806130-B0806134
BUILDER	: PT CAHAYA FORTUNA BAHARI	DWG NO	: PT/AFP/1059/08
HULL NO	: 168, 169, 170, 171 & 172	DATE	: 17/06/08
CLASS	: G.L.	PAGE	: 1 OF 2

PROPELLER PARTICULARS

PROPELLER DIAMETER	m	: 1.83
PITCH	m	: 1.222
PITCH RATIO		: 0.6678
DEVELOPED AREA RATIO		: 0.626
MAX.BLADE THICKNESS RATIO		: 0.0450
MAX.BLADE THICKNESS AT CENTRE		: 82.35
NUMBER OF BLADE		: 4
BOSS RATIO		: 0.1585
RAKE		: 120.5
DIRECTION OF ROTATION		: LH & RH
BLADE SECTION		: MAU
MATERIAL		: MANGANESE BRONZE
PROPELLER WEIGHT (KG)		: 551.00
WK ² IN AIR	kg*m ²	: 93.50
WK ² IN WATER	kg*m ²	: 115.00

BLADE THICKNESS CALCULATION AS PER ABS RULE

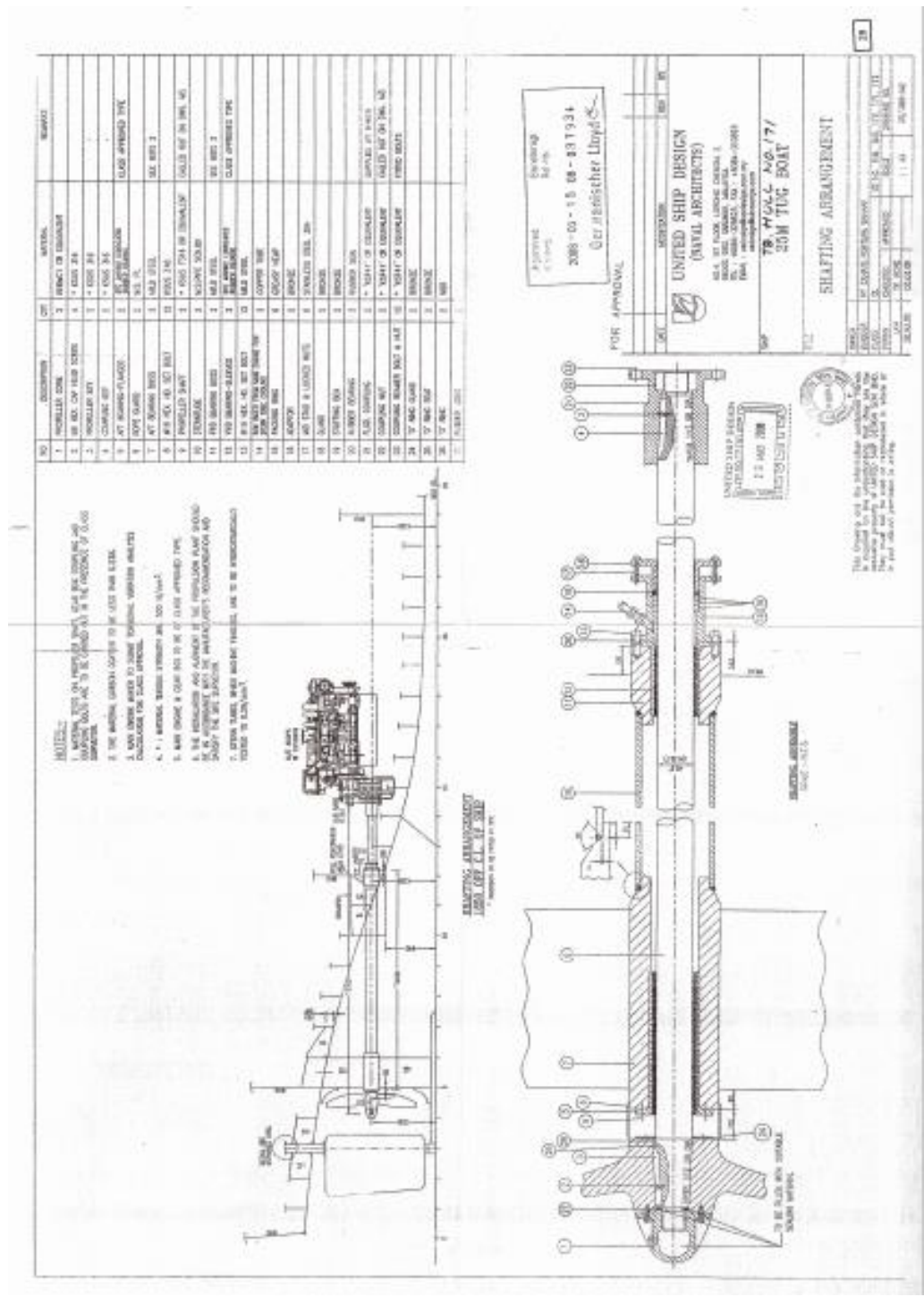
H	= Horse Power	PS	: 600
R	= RPM		: 311.07
D	= Propeller Diameter	m	: 1.83
N	= Number of Blade		: 4
P0.25	= Pitch Ratio at 0.25R		: 0.6678
P0.70	= Pitch Ratio at 0.70R		: 0.6678
a	= D.A.R.		: 0.626
W	= Maximum blade width at 0.25R		: 469.7
K	= Rake		: 120.46204
S	= const. depending on prop.dia	=	1
f	= material constant	=	2.1
w	= material constant	=	8.3
A	= $1.04(6.0/p0.70)+4.3P0.25$	=	12.8566
B	= $(4300waN)(R/100)^2(D/20)^3$	=	41.4051
C	= $(1+1.5P0.25)(Wf-B)$	=	1891.4063
T	= (designed thickness at 0.25 radius)	=	63.8875
Cs	= au/WT	=	0.6715
Cn	= $kwUPWT^2$	=	0.1

t (required thickness at 0.25 radius in mm)
 $= S*(289*SQRT(AH/CsCRN)+(Cs/Cn)(BK/4C))$
 = 56.748707 mm

PROPELLER BLADE DESIGNED (MAU SECTION)

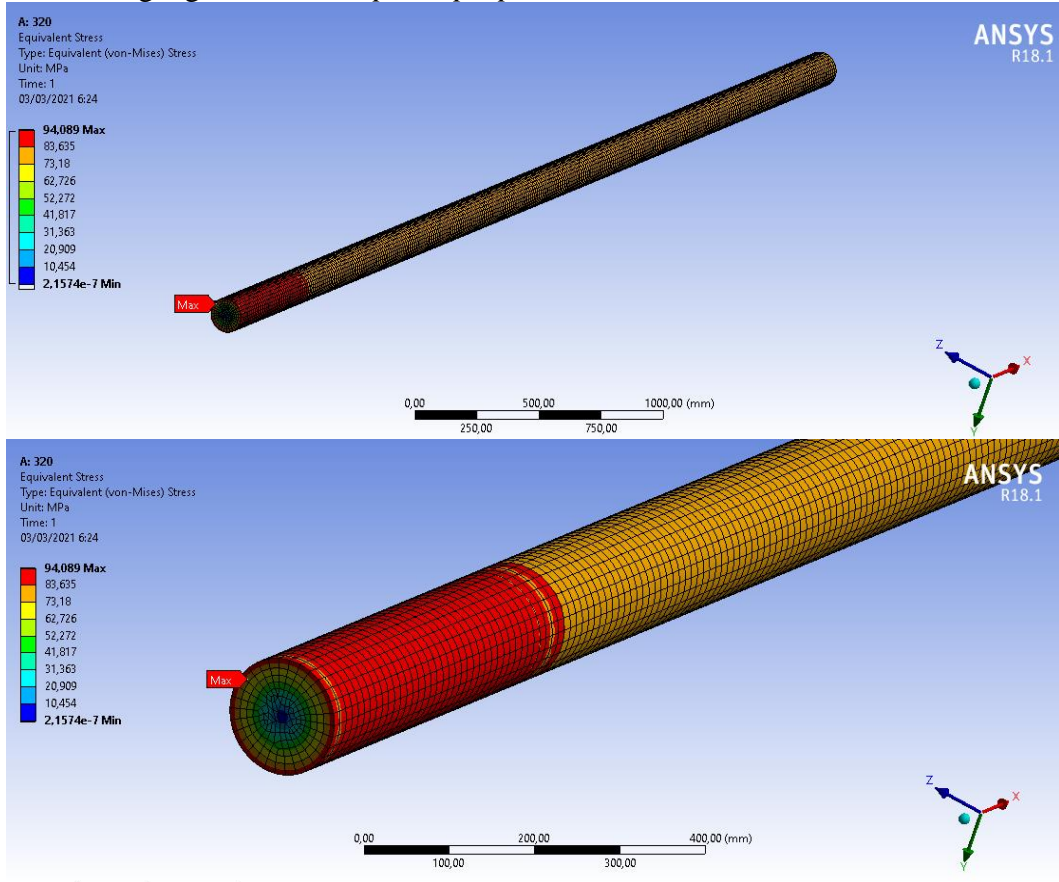
r/R	CL TO L.E.	CL TO T.B.	WIDTH	THICKNESS
0.20	250.0	181.0	431.0	67.6
0.25	269.8	199.9	469.7	63.9
0.30	286.6	216.7	503.3	60.2
0.40	313.0	251.1	564.1	52.8
0.50	329.0	282.0	611.0	45.4
0.60	331.4	310.6	642.0	38.0
0.70	313.0	332.5	645.5	30.7
0.80	262.6	339.3	601.9	23.3
0.90	162.8	314.1	476.9	15.9
0.95	87.9	272.5	360.4	12.2
1.00	0.0	111.9	0.0	8.5

Lampiran 3 Gambar Shafting Arrangement Kapal Tug Boat

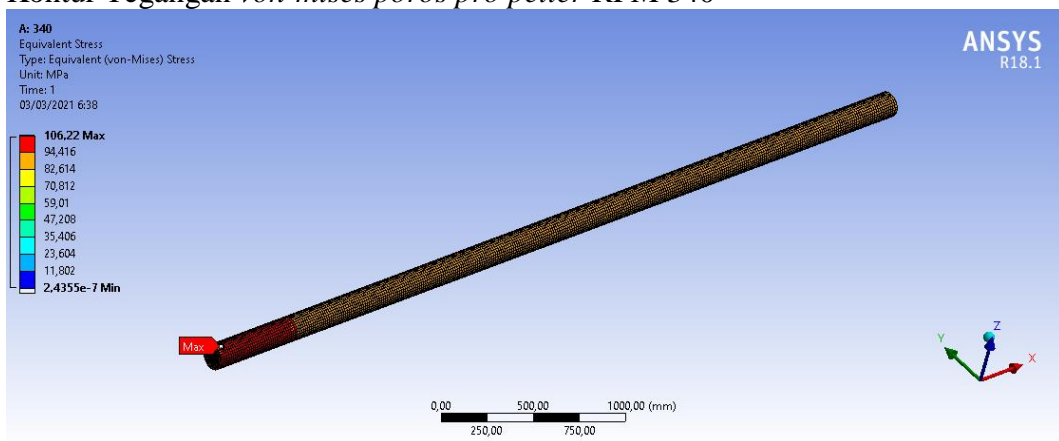


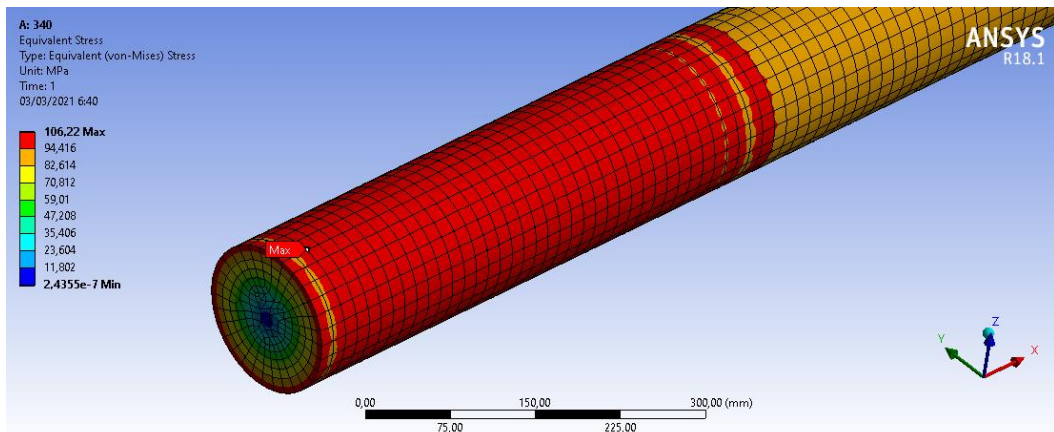
Lampiran 5 gambar sebaran tegangan *von-mises*

Kontur Tegangan *von-mises* poros propeller RPM 320

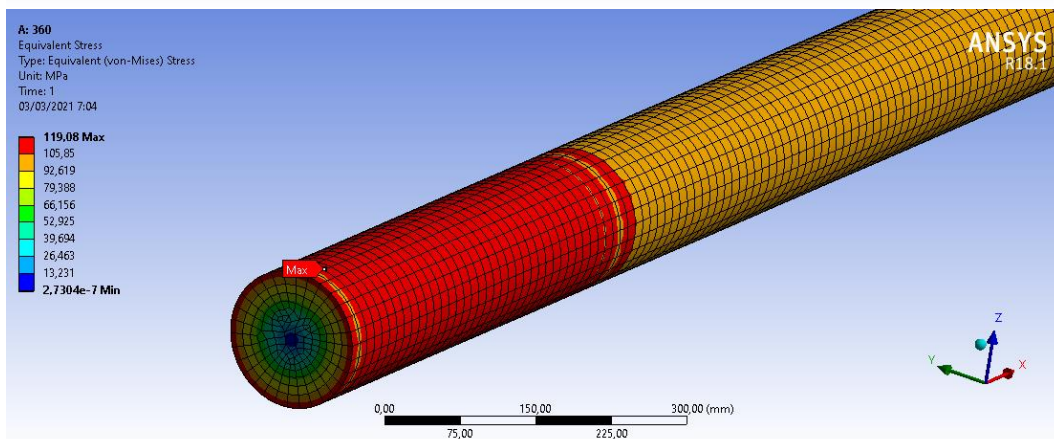
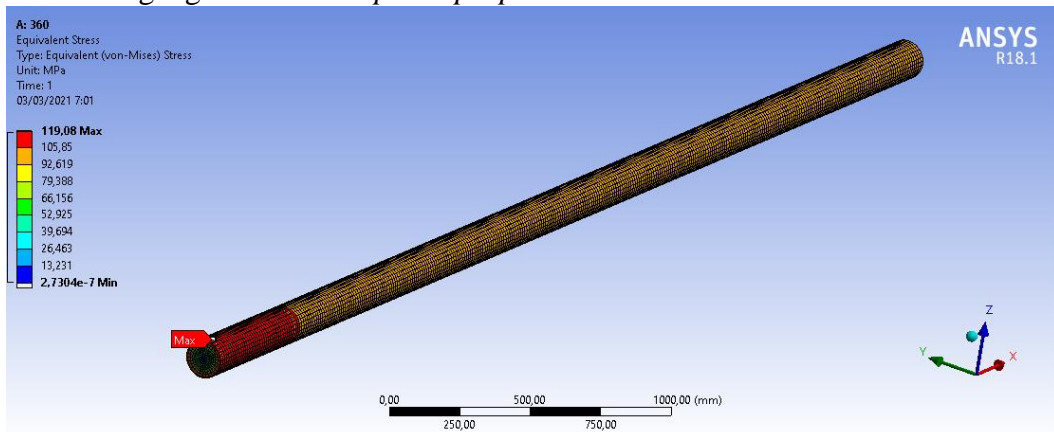


Kontur Tegangan *von-mises* poros pro peller RPM 340

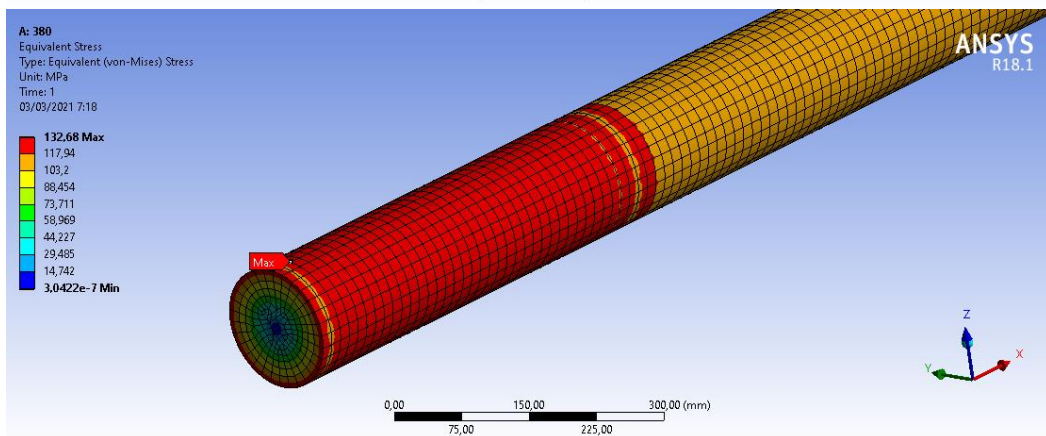
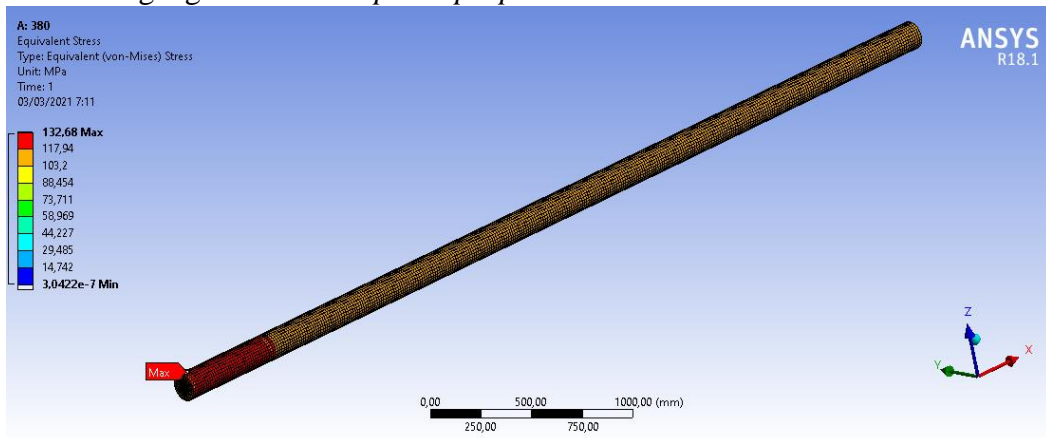




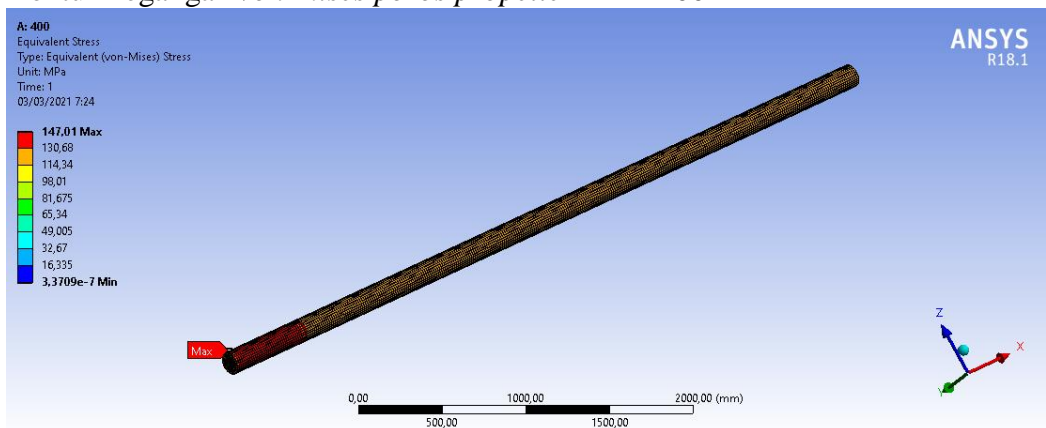
Kontur Tegangan von-mises poros propeller RPM 360

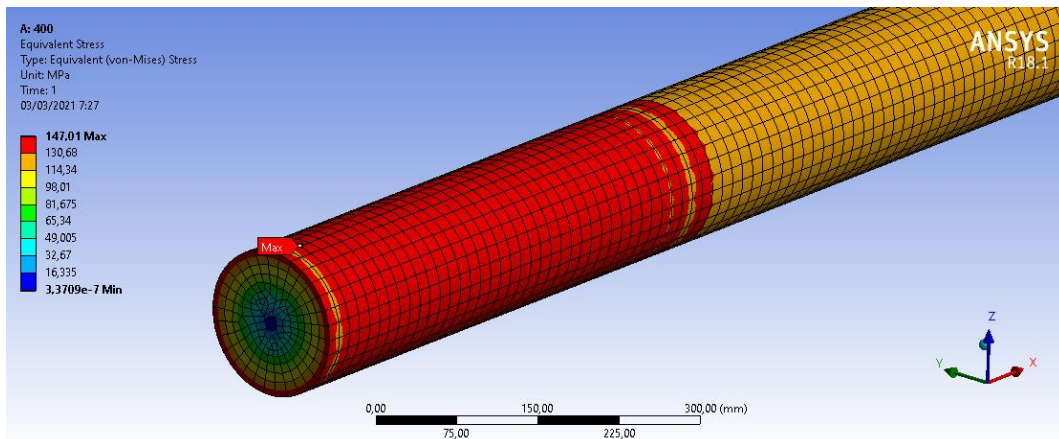


Kontur Tegangan von-mises poros propeller RPM 380



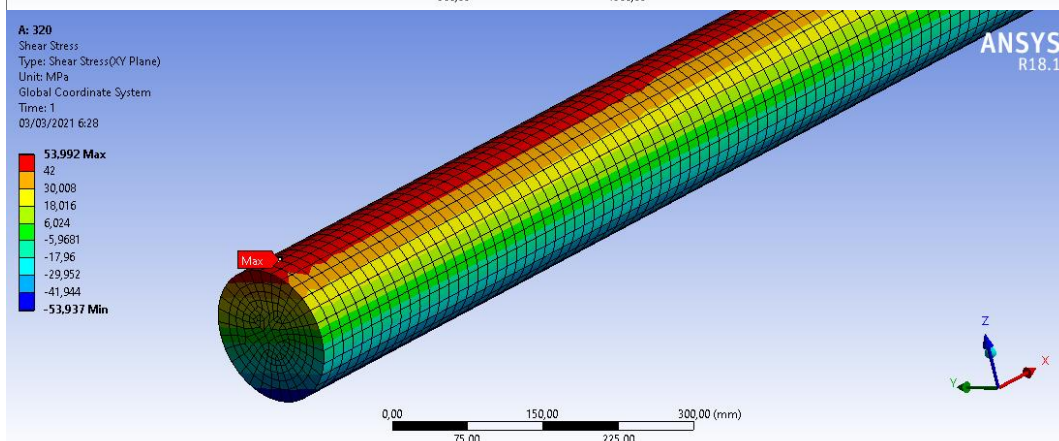
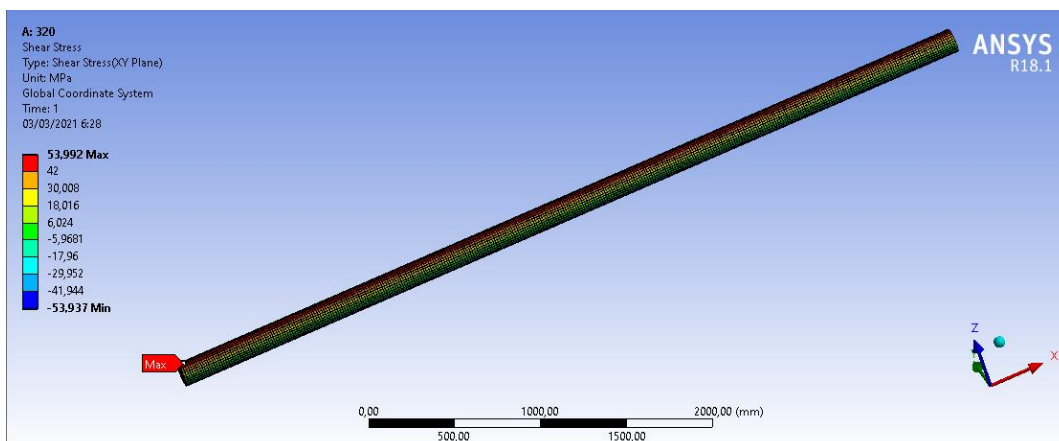
Kontur Tegangan von-mises poros propeller RPM 400



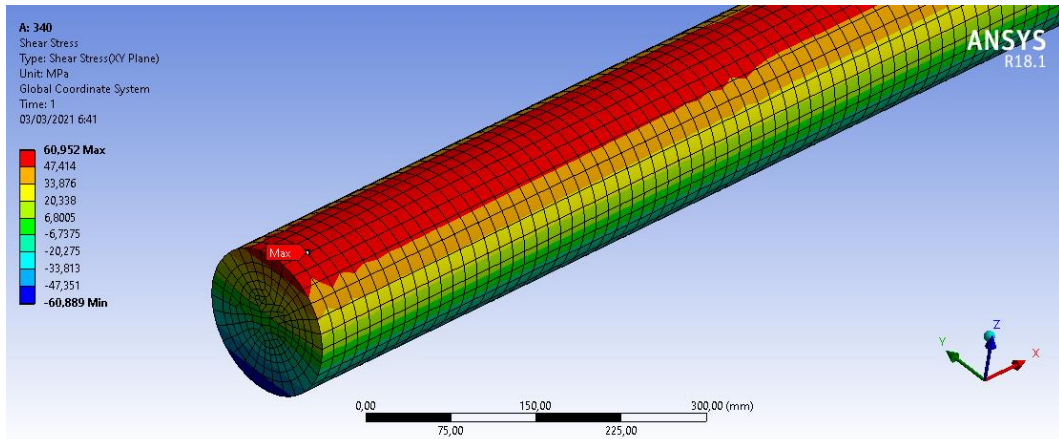
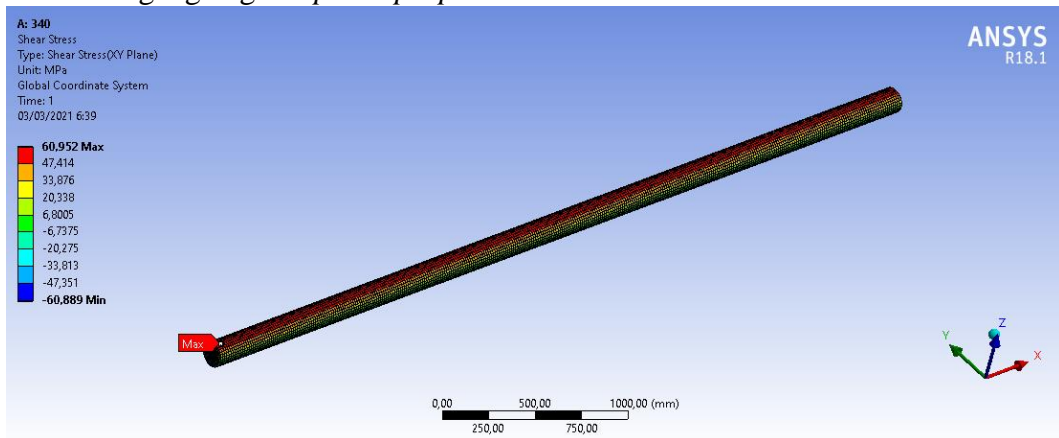


Lampiran 6 gambar sebaran tegangan geser

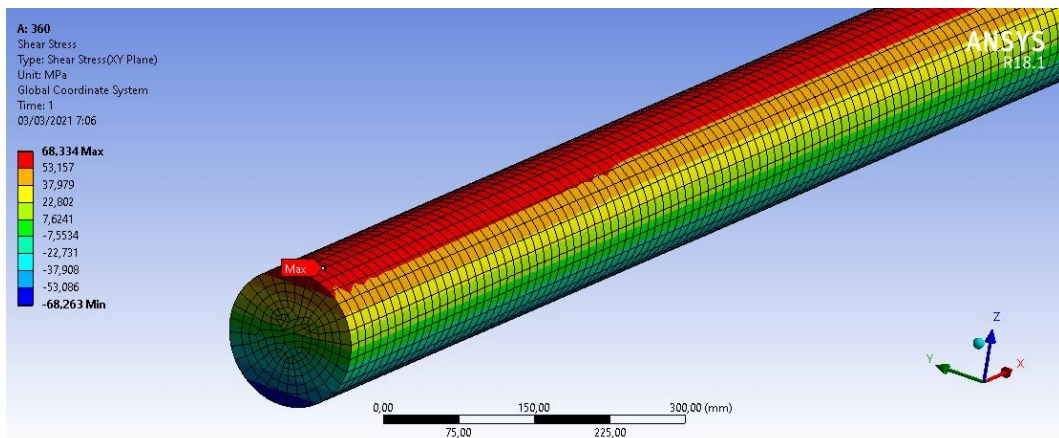
Kontur Tegangan geser poros propeller RPM 320

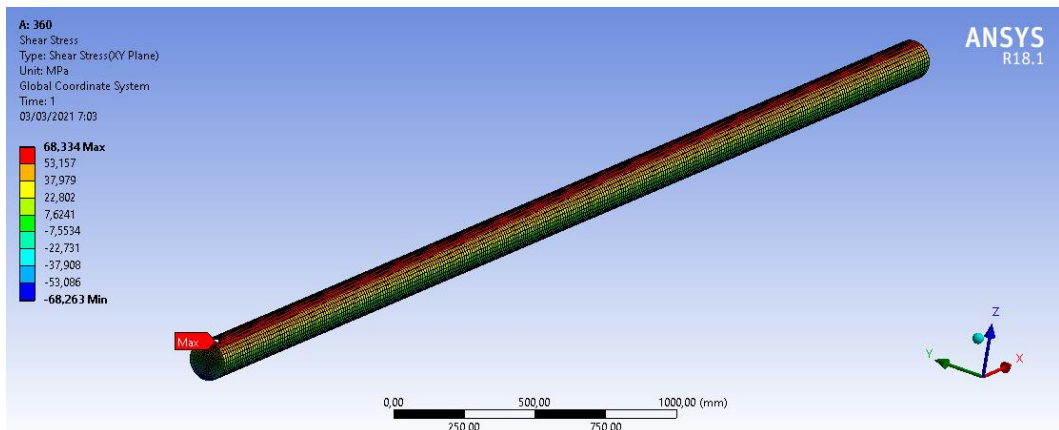


Kontur Tegangan geser poros propeller RPM 340

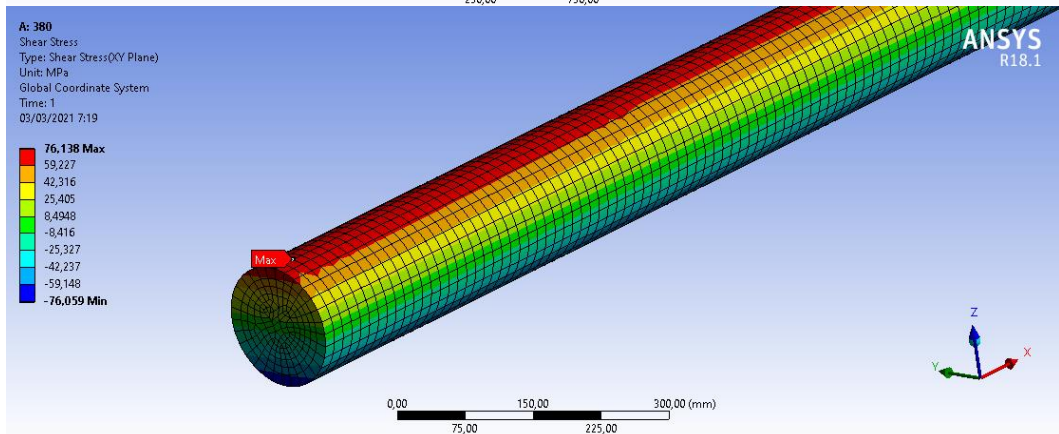
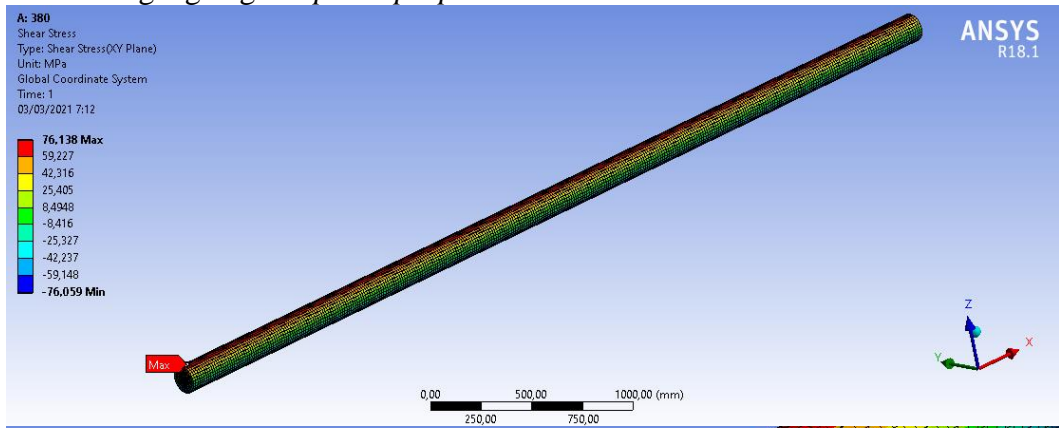


Kontur Tegangan geser poros propeller RPM 360

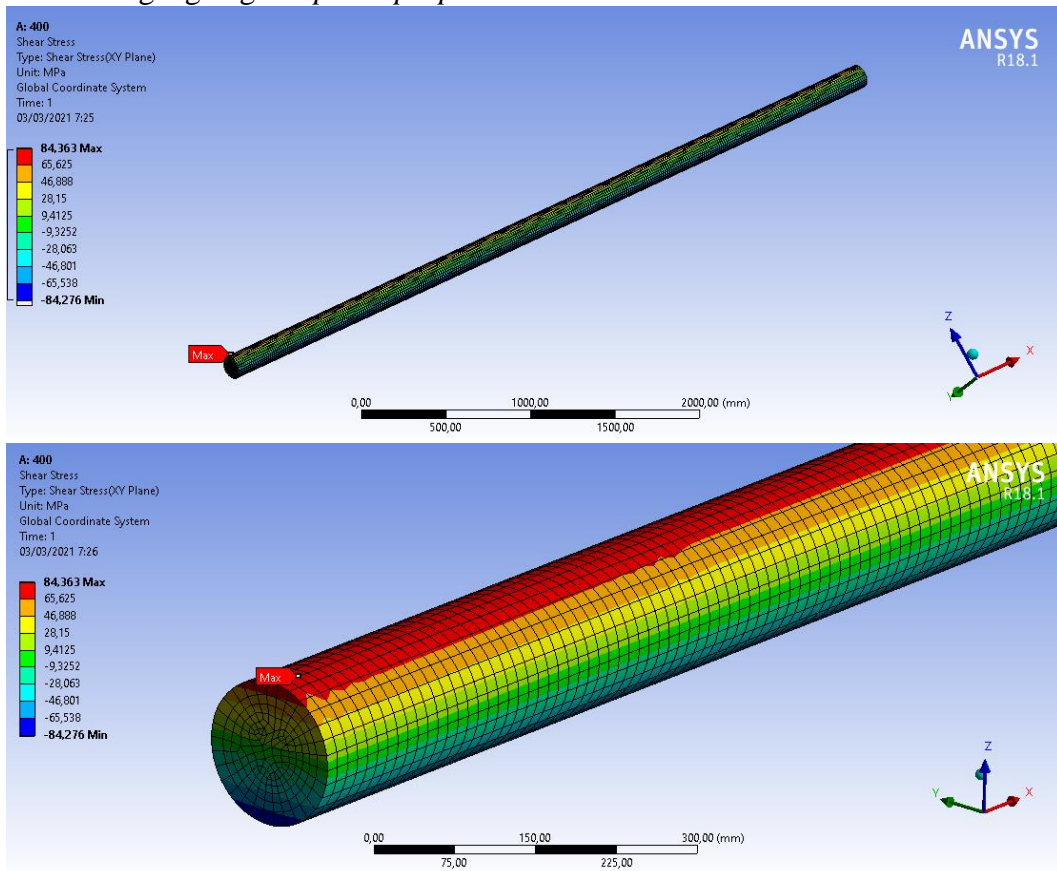




Kontur Tegangan geser *poros propeller RPM 380*

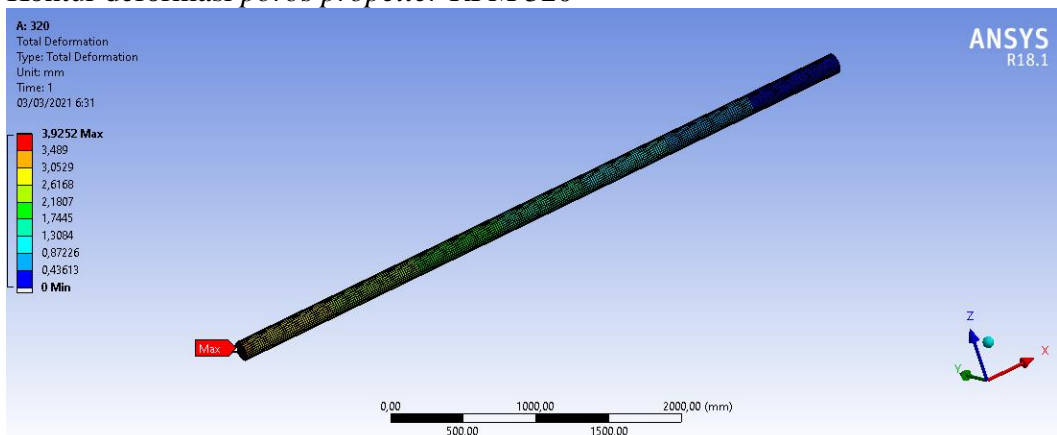


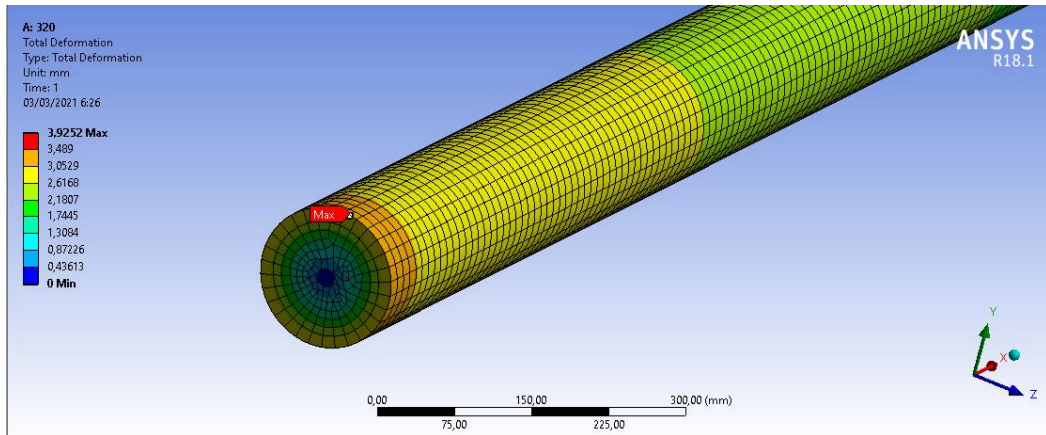
Kontur Tegangan geser poros propeller RPM 400



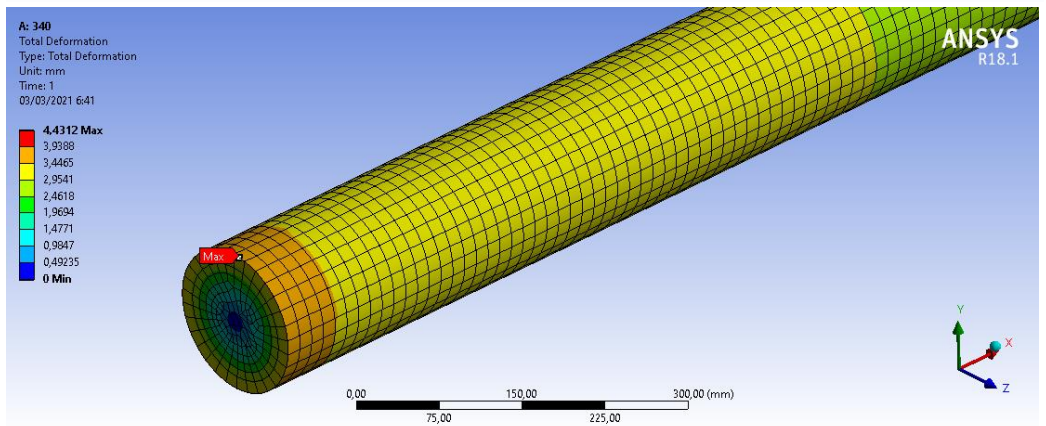
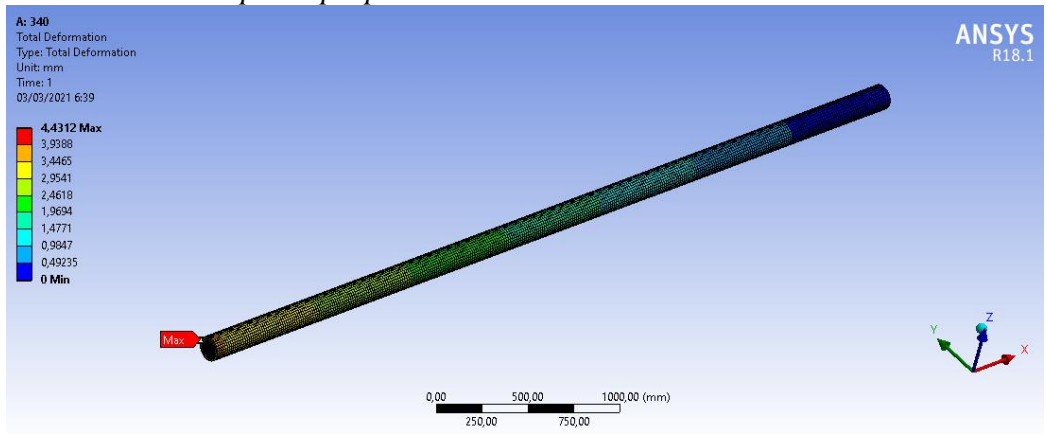
Lampiran 7 gambar sebaran deformasi

Kontur deformasi poros propeller RPM 320

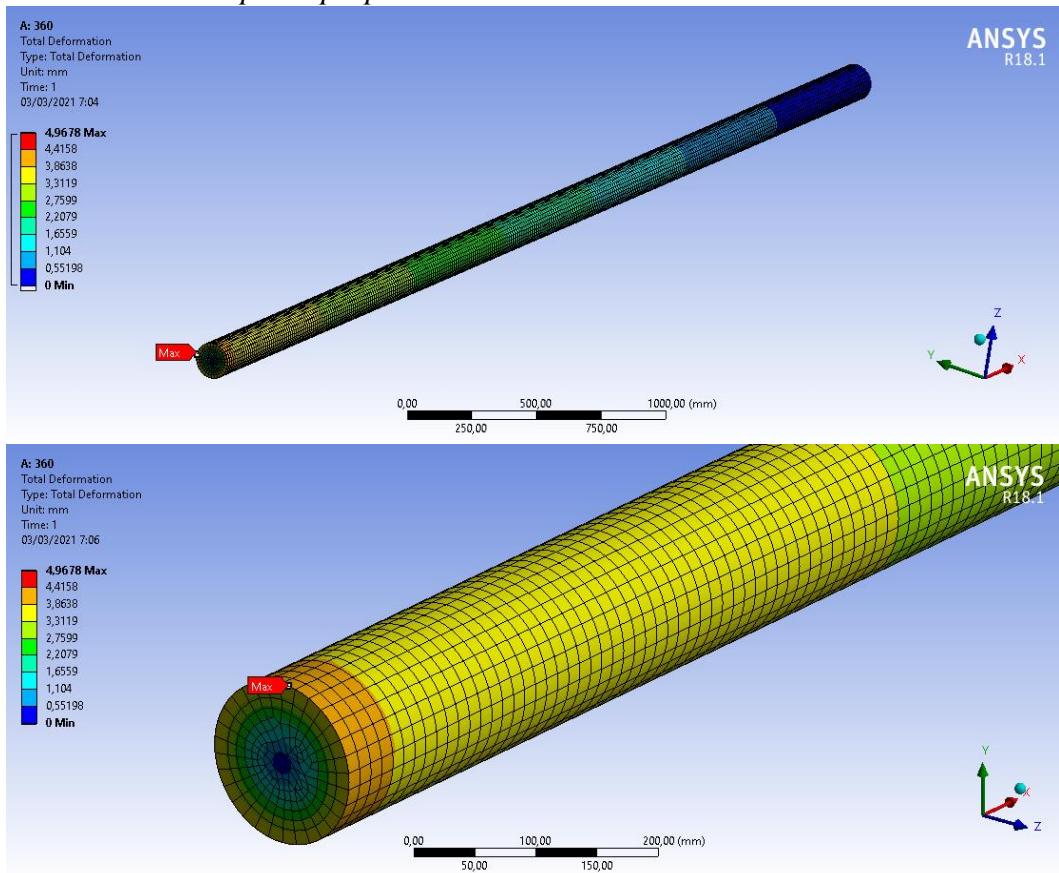




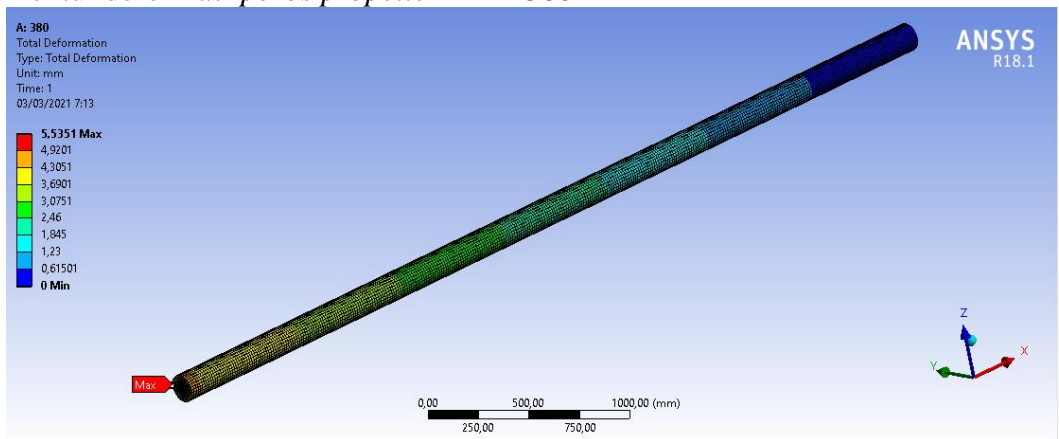
Kontur deformasi *poros propeller RPM 340*

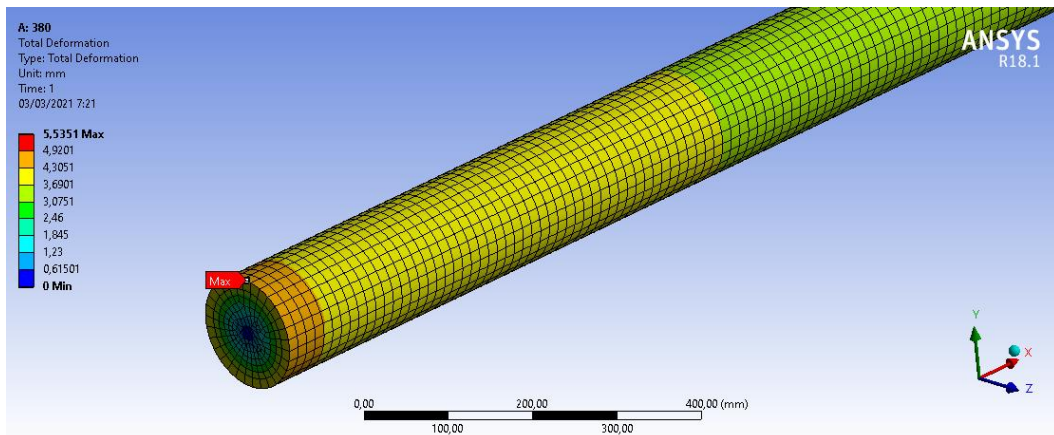


Kontur deformasi poros propeller RPM 360



Kontur deformasi poros propeller RPM 380





Kontur deformasi *poros propeller* RPM 400

