Alternatives for spools –

Parameters	Spool	Differential	LSD
1) Weight	low	high	high
2) Cost	low	high	high
3) Reliability	More	less	leess
4) Power loss	lees (No)	more	more
5) Ease of handling	more	lees	lees
6) Maintanance	eary	difficult	difficult

Sprocket Teeth calculations

Torque at teeth = 1500 N·m   .... (from calculations of engine)

Force Torque at centre of sprocket = $\dfrac{1500}{0.10843}$

$$= 13833 \text{ N}$$

Force on one teeth = $\dfrac{13833}{31}$

$$= 446.22 \text{ N}$$

Area of half teeth = $8.513 \times 10^{-5} \text{ m}^2$ (From catia)

Stress on one teeth = $\dfrac{\text{force}}{\text{Area of half teeth}}$

$$= \dfrac{446.22}{8.513 \times 10^{-5}}$$

$$= 5.241 \times 10^{6} \text{ N/m}^2$$

Stress on one teeth = 5.241 MPa

Ultimate tensile strength = 505 MPa

Permissible shear stress = $\dfrac{505}{3}$

$$= 168.333 \text{ MPa}$$

As the working stress is less than permissible shear stress. Our design is valid

calculations for web on spool:-

force acting on spool = 13833 N

force on one mount = $\dfrac{13833}{5}$

$= 2766.6$ N

Area of one mount = 1.319×10^{-4} m²

stress at mount = $\dfrac{2766.6}{1.319 \times 10^{-4}}$

$= 20.9749 \times 10^{6}$ N/m²

$= 20.974$ MPa

We know the Ultimate tensile strength of material

$\therefore$ Sut = 124 MPa

Permissible shear stress = $\dfrac{124}{3}$

$= 41.33$ MPa

$\therefore$ As working stress is less than permissible shear stress. Our design is valid

A. Calculations for no. of teeth :- (43 tooth sprocket)

Gear	N (rpm)	T (N·m)	For turboT (N·m)
1	1019	248	496
2	1465	173	346
3	1912	132	264
4	2378	106	212
5	2842	89·30	178·6
6	3236	78	156

for sproc' final gear ratio :-

pinion to sprocket

final gear ratio = $\dfrac{\text{No. of teeth on sprocket}}{\text{No. of teeth on pinion}}$

$$= \frac{43}{15}$$

$$= 2.8667.$$

Torque for sprocket

Gear	T (N·m)
1	1421.88
2	991.87
3	756.80
4	607.74
5	511.99
6	447.20