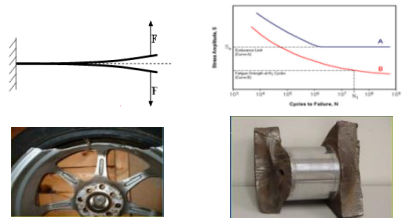




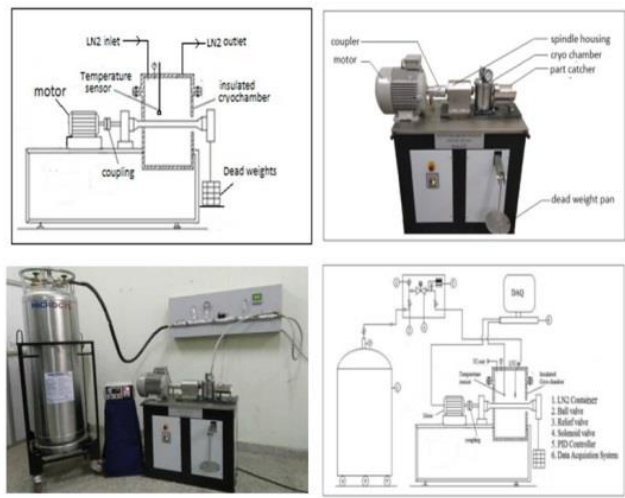
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 Bengaluru, INDIA

## FATIGUE STRENGTH

Fatigue strength is the highest stress that a material can withstand for a given number of cycles without fracture.



## DEVELOPMENT OF FATIGUE TESTING MACHINE

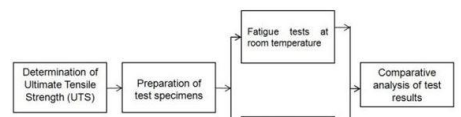


No	Applied Load	Stress MPa	Number of cycles for failure (N)	
			Room Temp	77K
1	203N	1053	-	17760
2	189N	981	-	131036
3	175N	908	-	170913
4	161N	835	-	No fracture
5	143N	742	5688	No fracture
6	131N	680	24247	No fracture
7	123N	638	221028	No fracture
8	116N	602	No fracture	No fracture
9	102N	529	No fracture	No fracture
10	87N	451	No fracture	No fracture

## MOTIVATION

- Limited data available at cryogenic temperature
- Existing data cannot be extrapolated down to 77K
- No ready system available to conduct tests at cryogenic temperature.
- Possibility of premature failure in absence of reliable data

## EXPERIMENTS

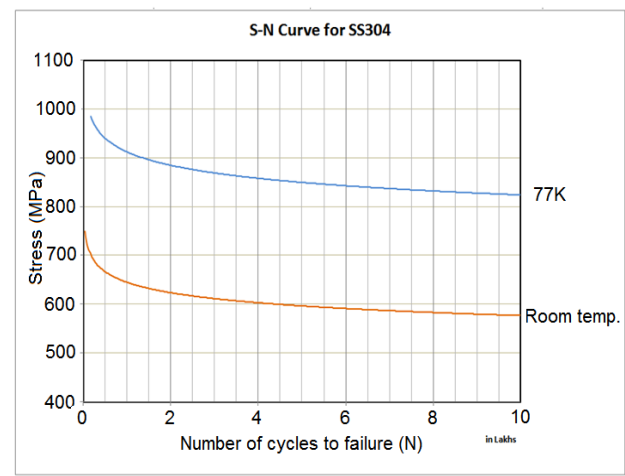


$$\frac{M}{I} = \frac{\sigma}{y}$$

where,  
 M = Bending moment due to applied load =  $\frac{FL}{2}$   
 I = Moment of inertia =  $\frac{\pi d^4}{64}$   
 $\sigma$  = ultimate tensile strength  
 $y = \frac{d}{2}$

Ultimate tensile strength : 755 Mpa  
 Load to cause failure : 145.55N

## RESULTS



## CONCLUSION

Fatigue strength at room temperature : 602 MPa  
 Fatigue strength at 77K : 835 MPa

## FACTORS INFLUENCING ENHANCEMENT

- Conversion of soft, tough, ductile austenite to hard and strong martensite structure
- Precipitation of micro size carbide particle and formation of dense atomic structure
- Increased strength properties of SS304 at cryogenic temperature
- Locking of atoms at low temperature requiring larger force to cause fracture.