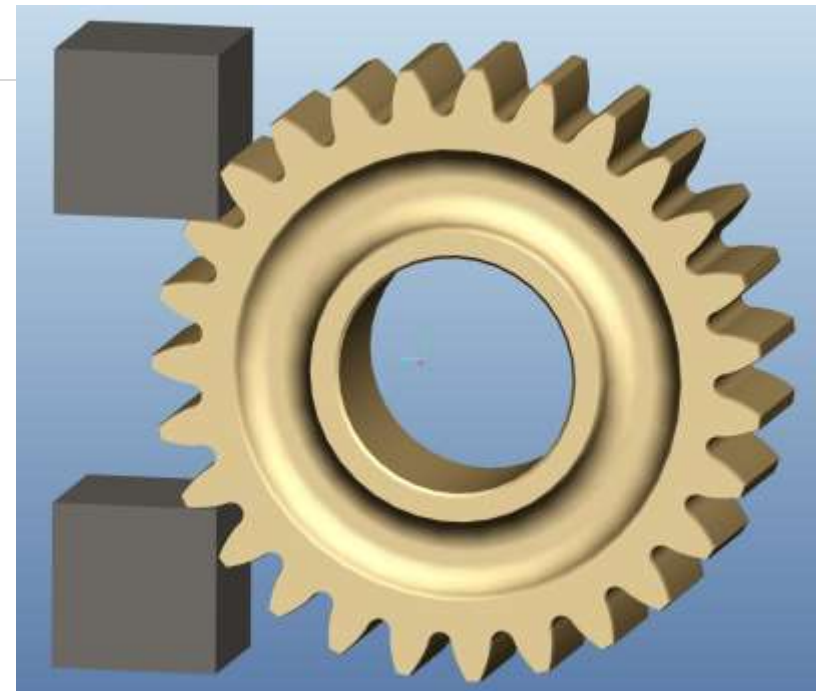
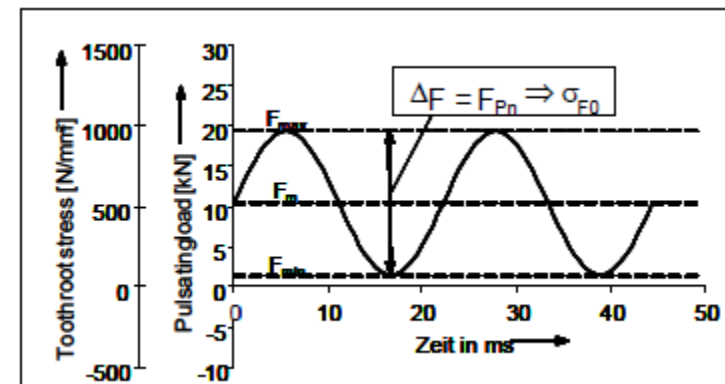
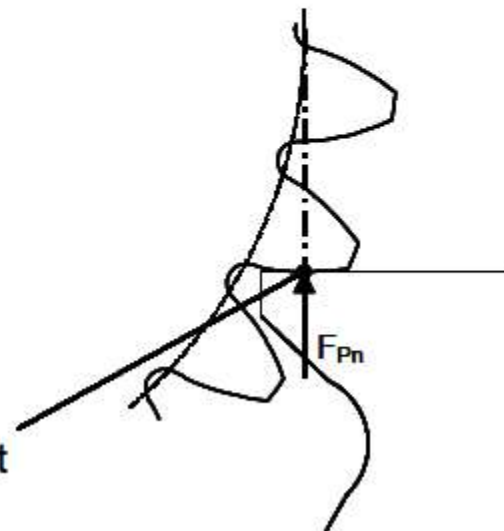
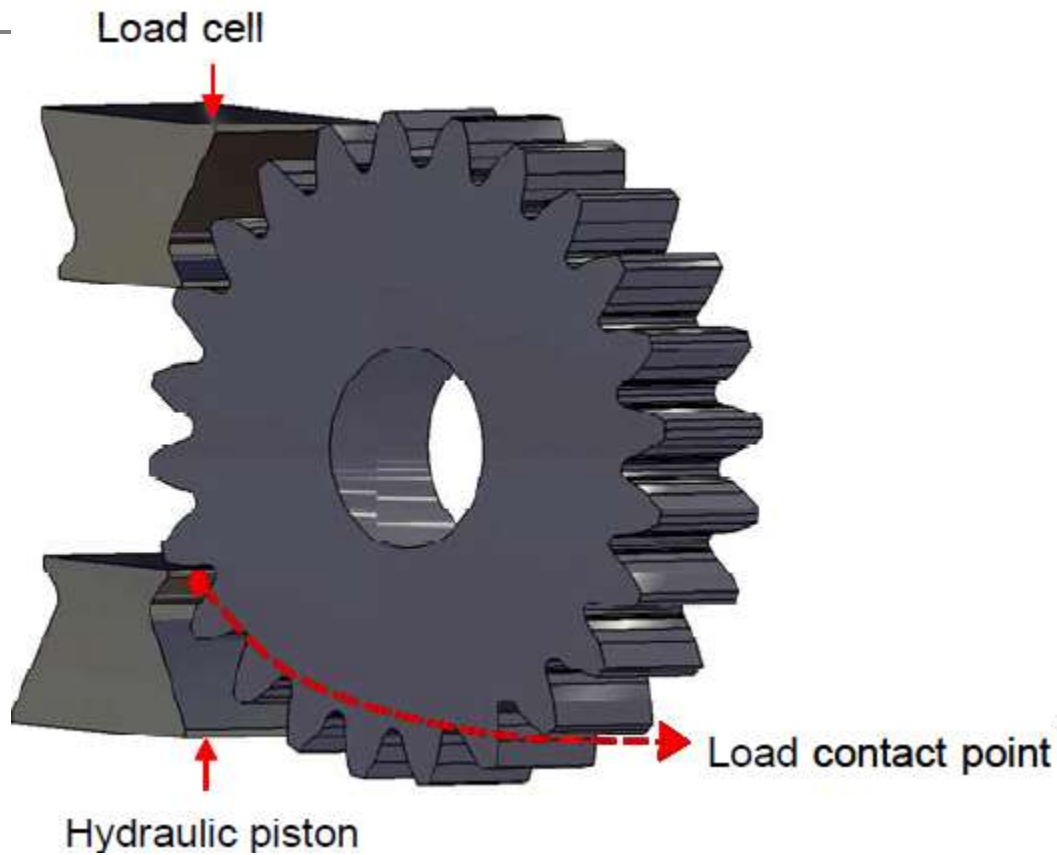


Single Tooth Bending Fatigue Test Fixture





B: Static Structural
Compression Only Support
Time: 1 s
8/22/2014 7:47 AM
A Fixed Support
B Frictionless Support
C Force: 55000 N
D Compression Only Support: 0. mm

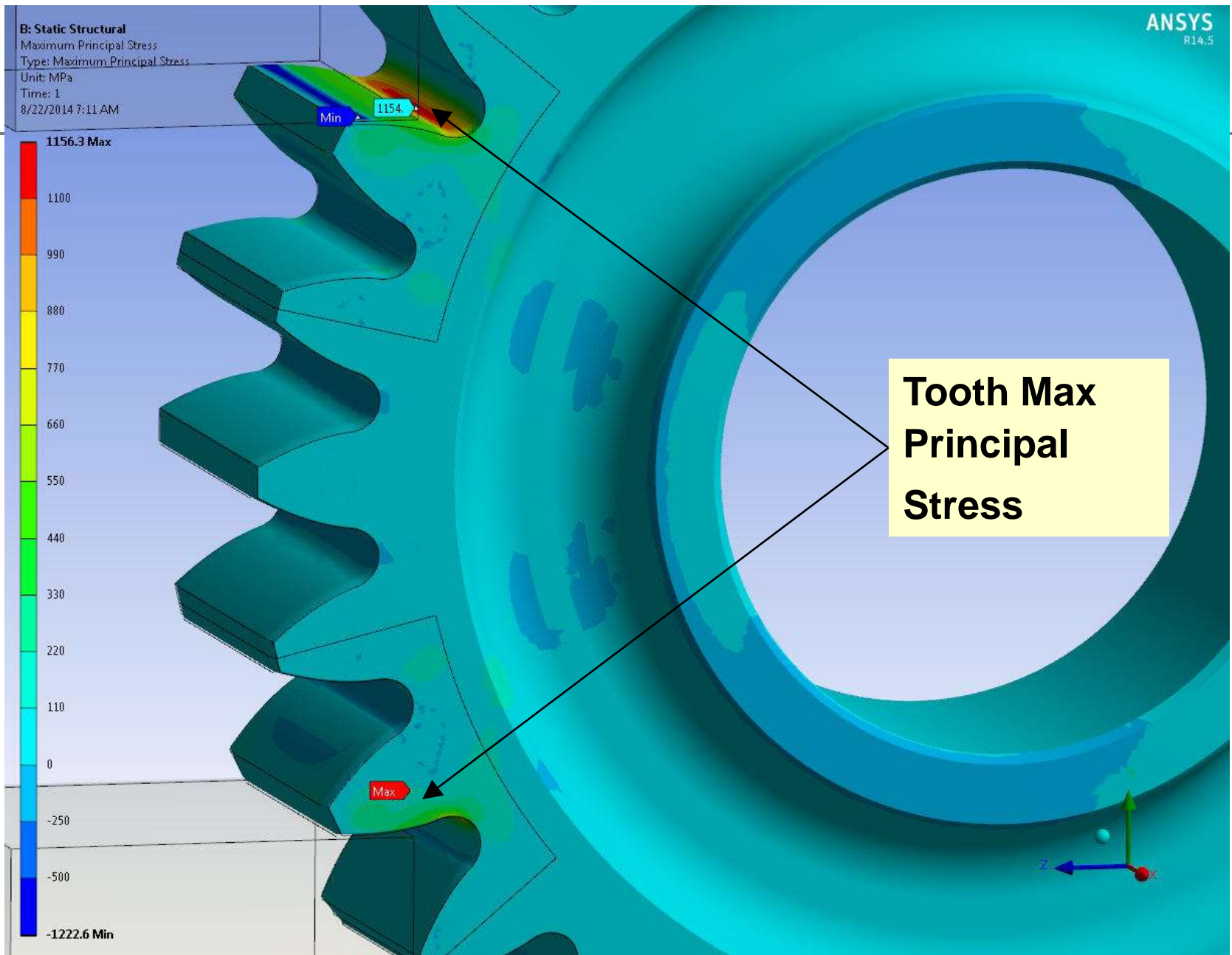
Gear Tooth Bending FEA Model

Rigid Constraints

Compression-Only Constraints

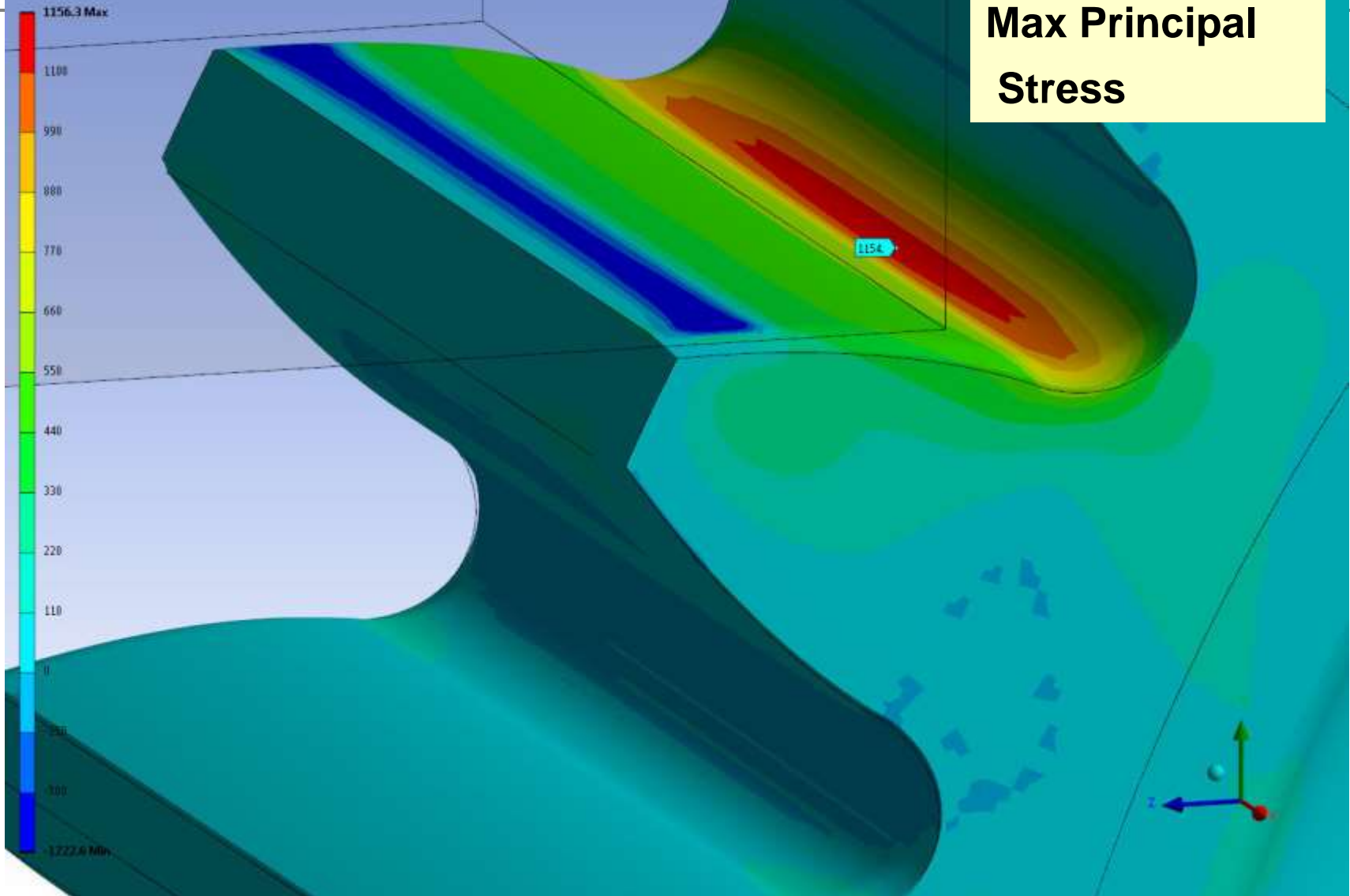
Frictionless Constraints

Load



B: Static Structural
Maximum Principal Stress
Type: Maximum Principal Stress
Unit: MPa
Time: 1
8/22/2014 10:08 AM

Upper Tooth Max Principal Stress



Inputs

Condition	Steel	Residual Stress	Heat Treatment
1	ETN-22 (similar to 4120)	Shot peen	Atmosphere carburizing
2	20MnCr5	Shot peen	Atmosphere carburizing
3	16MnCr5	Shot peen	Atmosphere carburizing

- Information to be provided:
 - Materials chemical composition
 - Material micro-structure
 - Micro-hardness profile
 - Residual stress profile
 - ANSYS finite element model (we ran for one load case only)

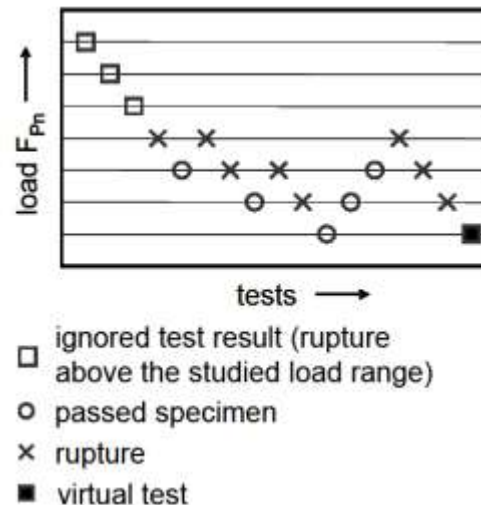
Outputs

- Virtual B1 S-N curve
- Raw data as shown in the table below

Run #	Parameter 1 (load)	Parameter 2 (hardness)	...	Parameter n	Life in number of cycles
1					
2					
...					
N					

Load cases and Expected Output results

- These are the output results from the analysis:
 - Number of cycles to failure (third column of the table)
 - Identification of failures initiated below the surface at inclusion
- The upper part of the table refer to endurance strength. Load shown in the second column are an example only. A stair case load approach (shown in the illustration below) should be used to determine the endurance limit. Suspension of 6 million load cycles is applied.
- Yet on the upper part of the table, last two rows, a very high load that result in about 1,000 load cycles is applied to determine the end of finite life part of the curve.
- The lower part of the table is straight forward, two load levels, repeated 5 times each until tooth breaks.



	Load case and runs #	Pulsating force F_{PN} [kN]	Number of load cycles N
Endurance Strength	1	62.5	
	2	62.5	
	3	55	
	4	55	
	5	57.5	
	6	57.5	
	7	55	
	8	60	
	9	60	
	10	60	
	11	62.5	
	12	65	
	13	62.5	
	14	62.5	
	15	60	
	16	60	
	17	67.5	
	18	65	
	19	65	
	20	65	
	21	90	
	22	90	
Time-limited fatigue range	23	70	
	24	70	
	25	70	
	26	70	
	27	70	
	28	75	
	29	75	
	30	75	
	31	75	
	32	75	