



An Interactive Web-based Tool for Fatigue Analysis and Life Prediction

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Abstract

- Interactive web-based tool creates a modern approach to fatigue analysis and life prediction for use in engineering classrooms.
- Bridge the gap between theory and reality.
- The unique attributes of this software allows engineering students to learn and gain more insight to fatigue analysis in a given semester.

Initial Customer Discovery (ICD)

- Conducted 30 customer interviews to determine the demand and need for software solution.
- Conducted market research at major universities with supporting engineering programs (Listed Below).
- Market Research Conclusion:** Engineering professors need an educational fatigue software to familiarize students with fatigue, better preparing them for product development roles in industry.

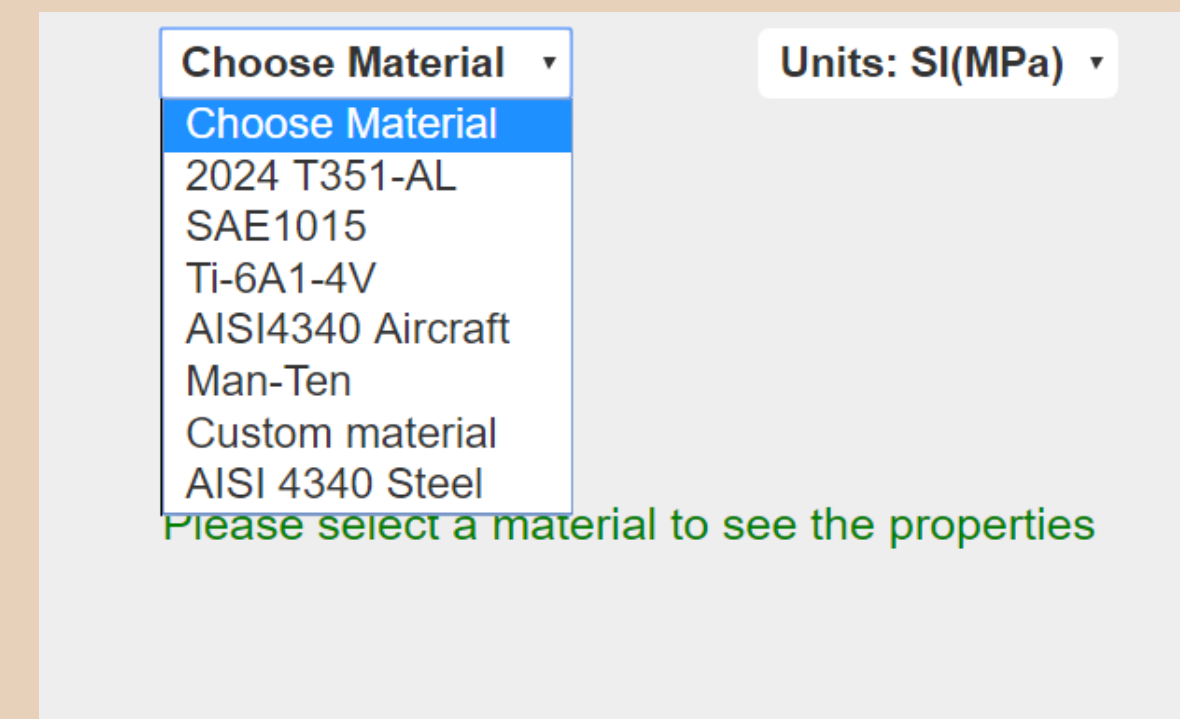


How it works?

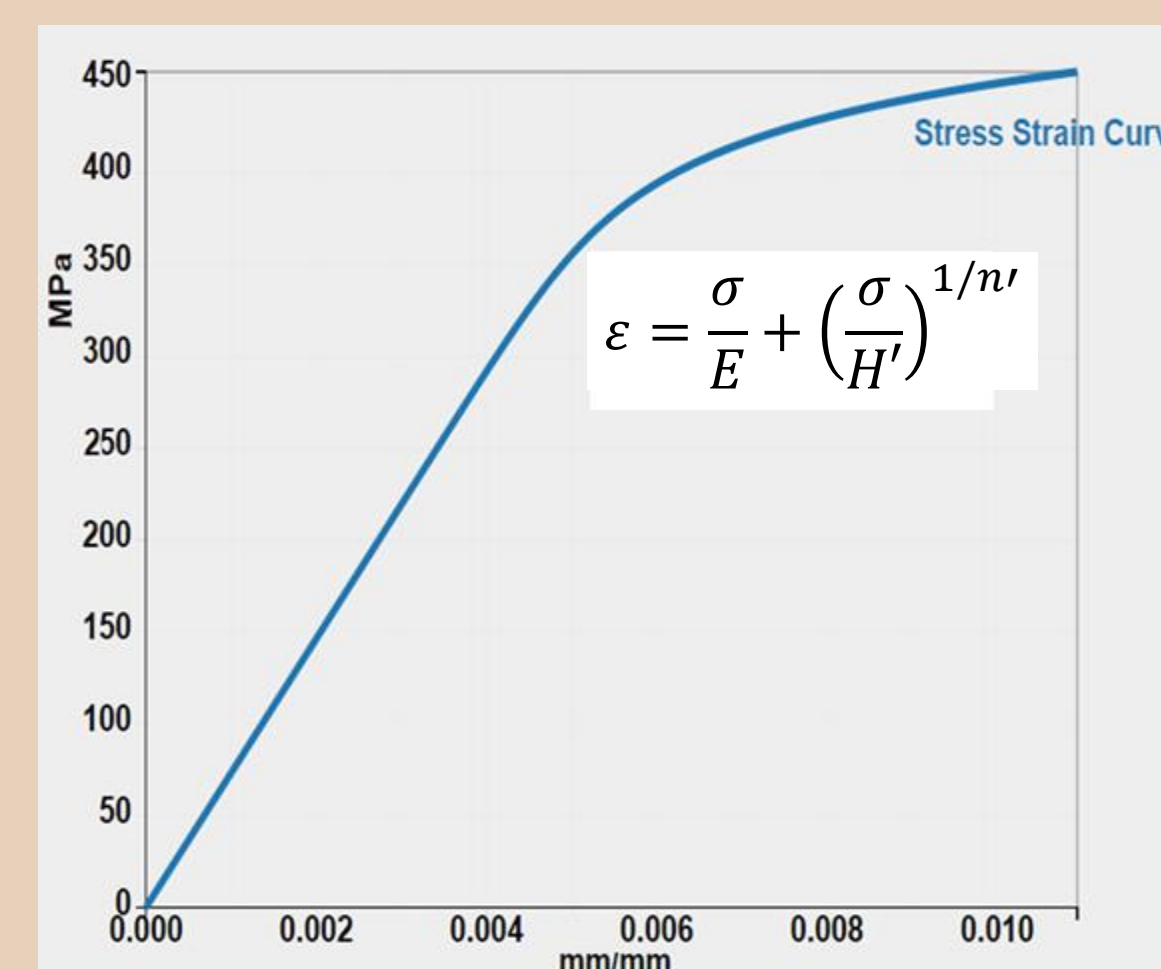
- The web-based fatigue analysis tool provides just-in-time guidance that is simple and easy to use for engineering students.
- Combines existing fatigue principles in a new and novel approach and also utilizes a proprietary algorithm, which in turn provides a much quicker and comprehensive analysis.
- With the utilization of cloud computing, the web-based fatigue tool will be available anywhere and anytime with on demand updates.
- Engineering students will be able to learn basic fatigue concepts, solve homework problems, and conduct fatigue life analysis research all outside of the classroom, in an interactive and user friendly environment.

Step by Step input to the Software

Step 1 : Choose the material

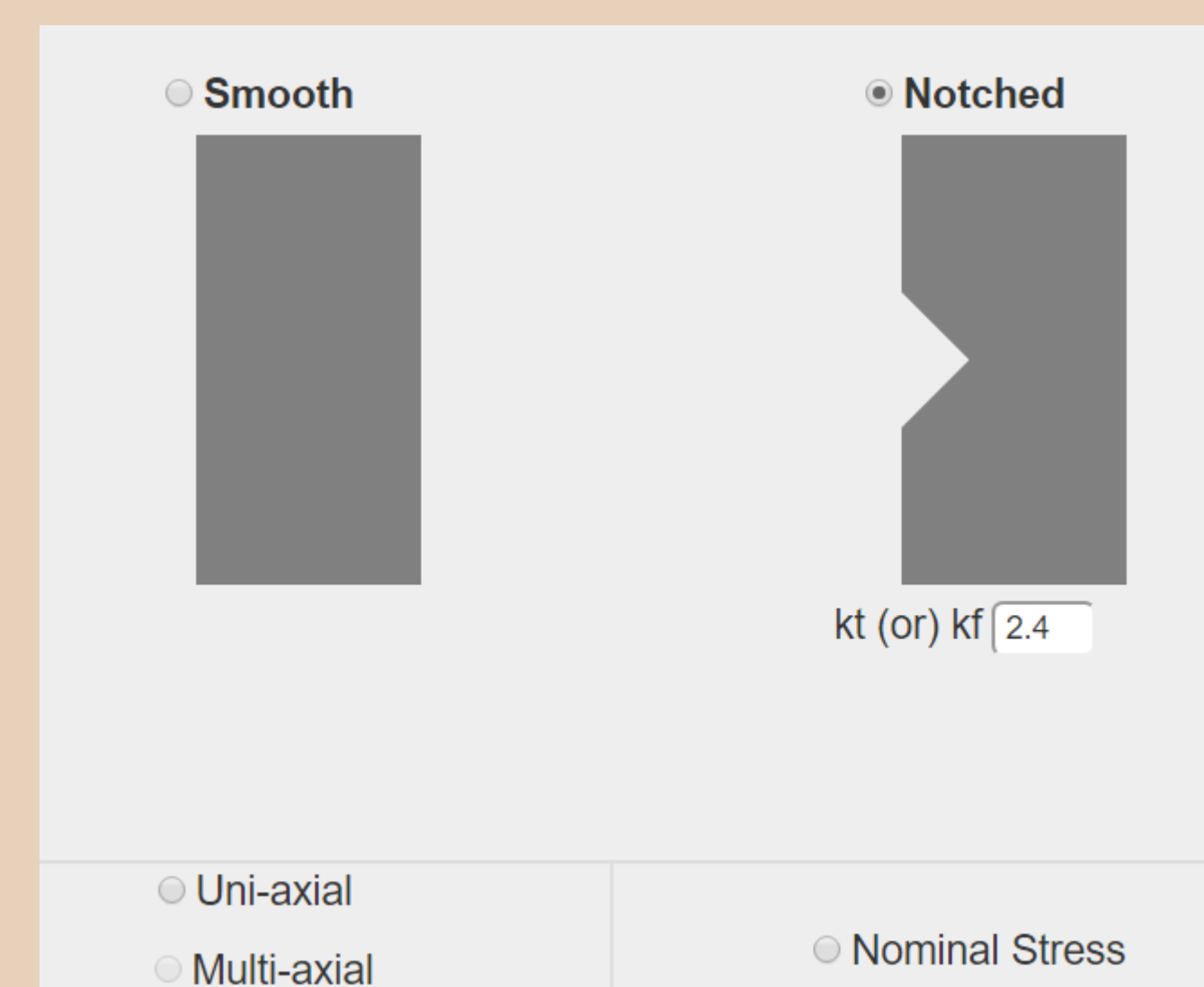


Property	Variable	Value	Units
0.2% Yield Strength	σ_0	379	MPa
Ultimate Tensile Strength	σ_u	455	MPa
Elastic Modulus	E	73100	MPa
Cyclic Strength Coefficient	H'	662	MPa
Fatigue Strength Coefficient	σ_f'	927	MPa
Cyclic Strain Hardening Exponent	n'	0.07	
Fatigue Strain Exponent	b	-0.113	
Fatigue Ductility Coefficient	ϵ_f'	0.409	
Fatigue Ductility Exponent	c	-0.713	
Walker's Exponent	γ	0.5	

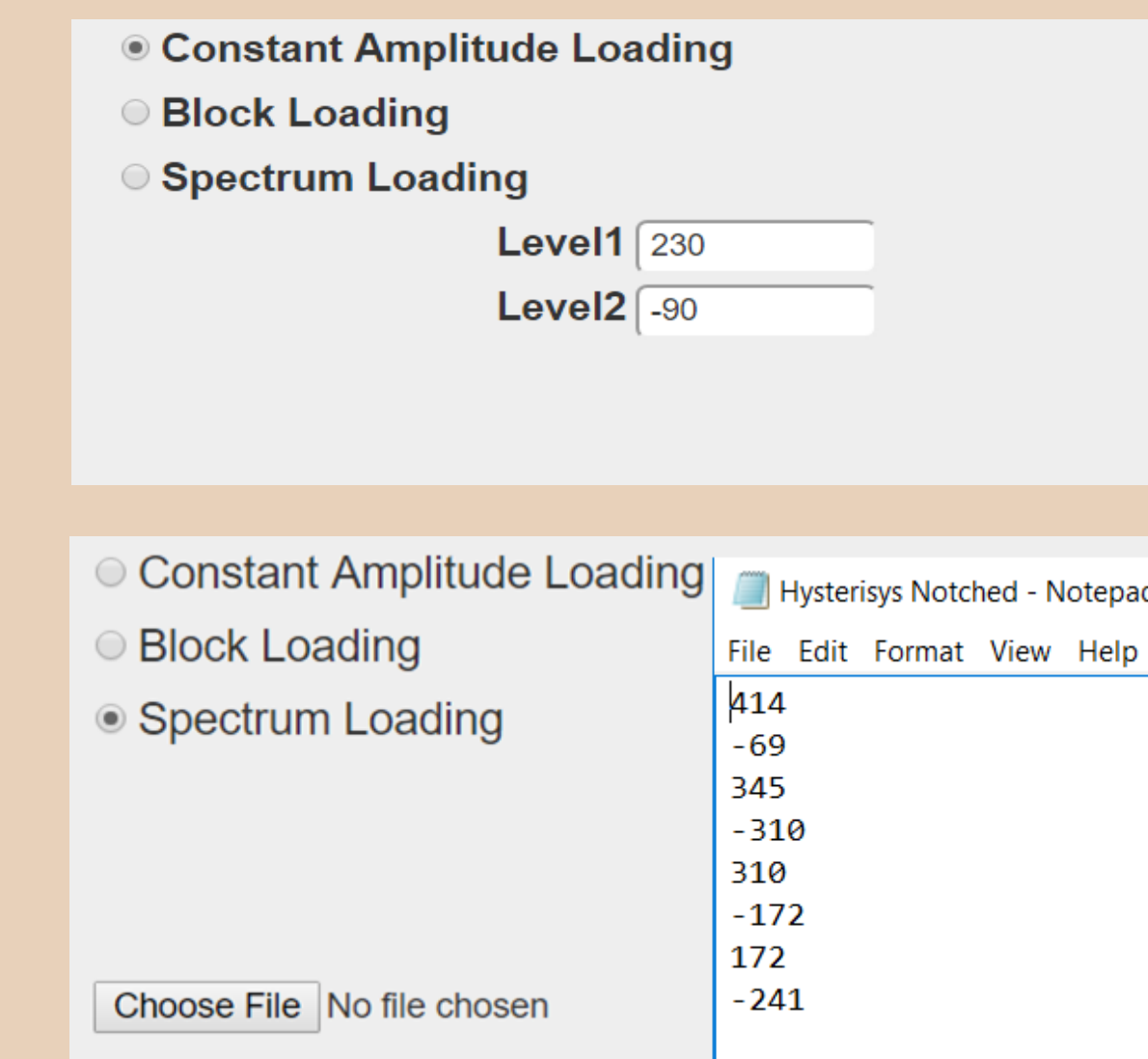


Step 2:

a: Select Specimen Type



b: Select Loading Conditions



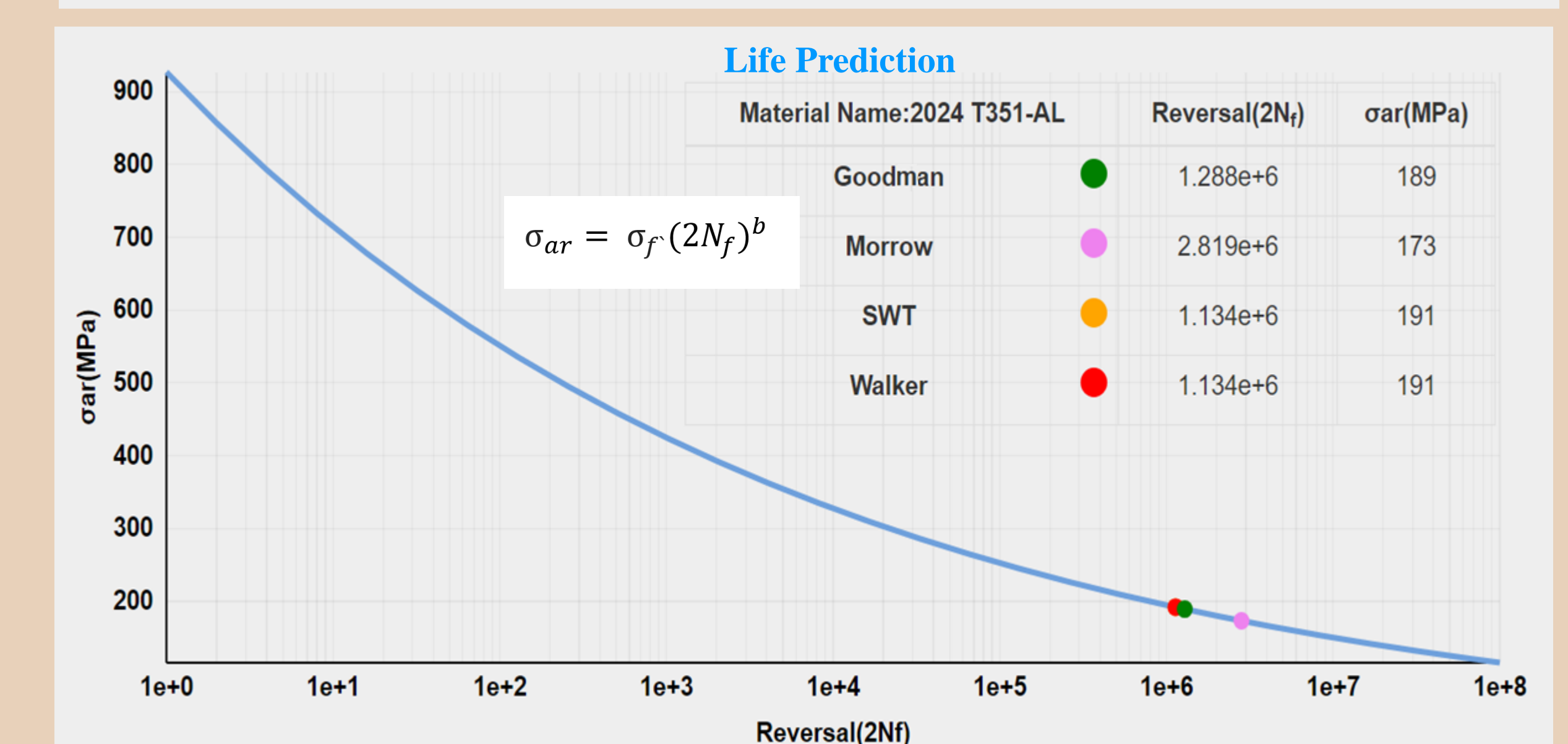
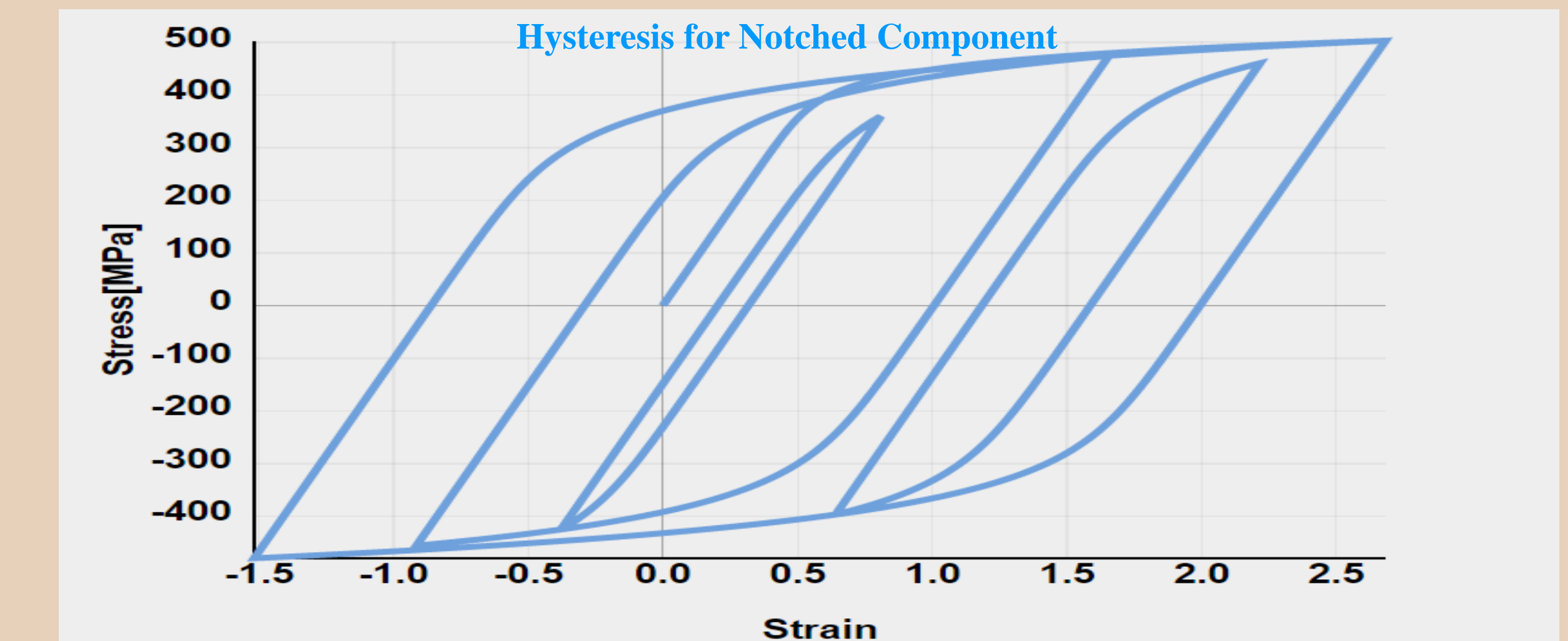
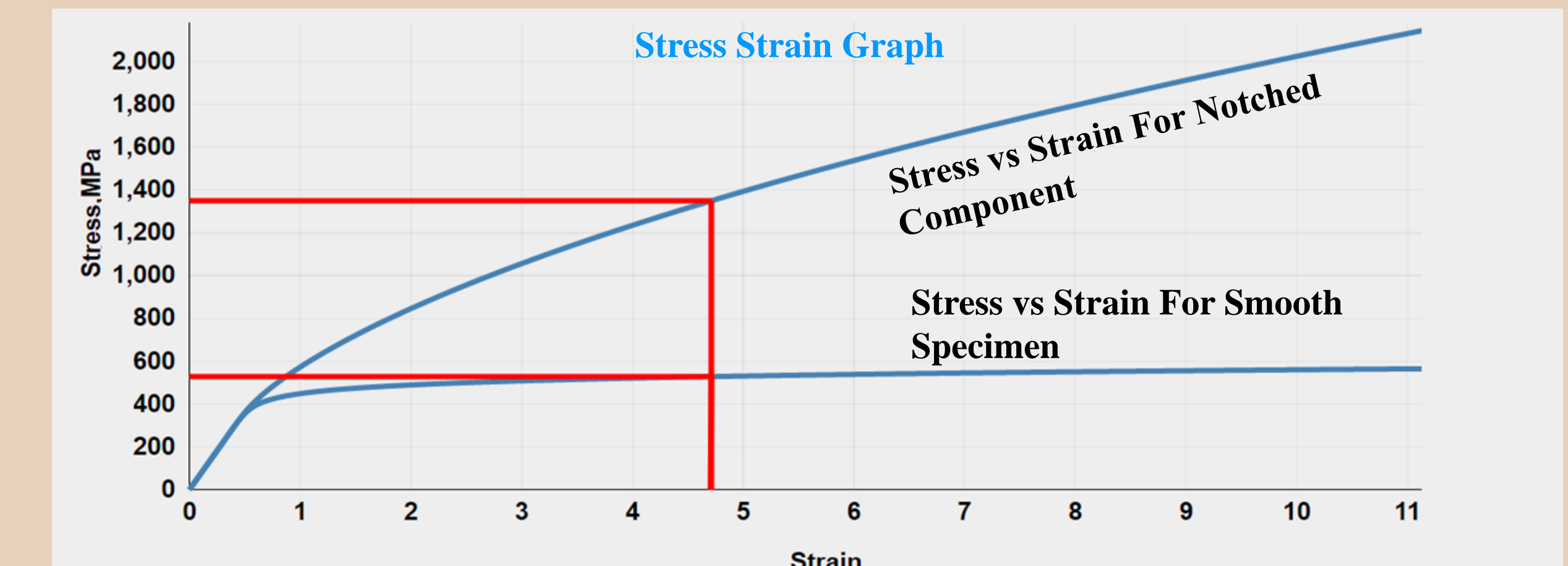
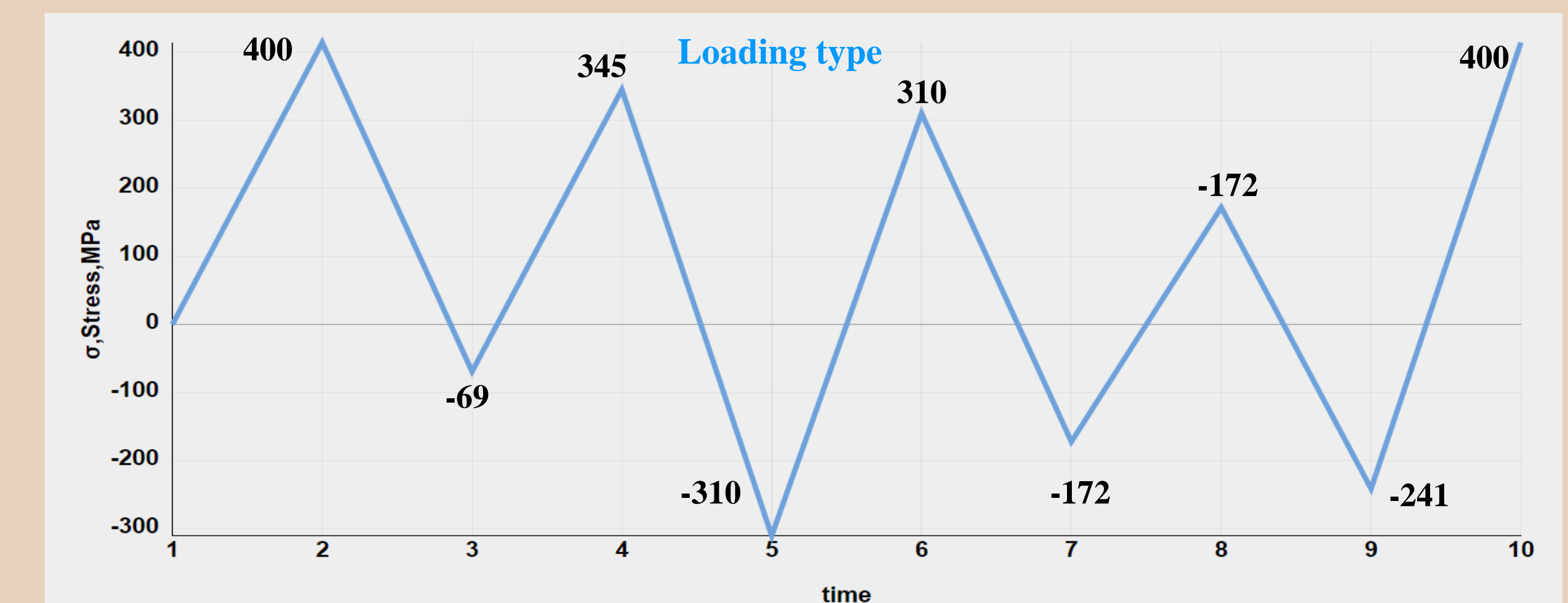
Step 3: Life Prediction utilizing 4 different approaches.

- Goodman
- Morrow
- SWT
- Walker

*See output graphs for comparison



Output Graphs from Software



Acknowledgements

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Conclusions

- Market research conducted to verify need for educational fatigue software tool.
- Extensive software development performed, final features currently in development stage.
- Pilot test of software in classrooms soon to follow at WMU College of Engineering.