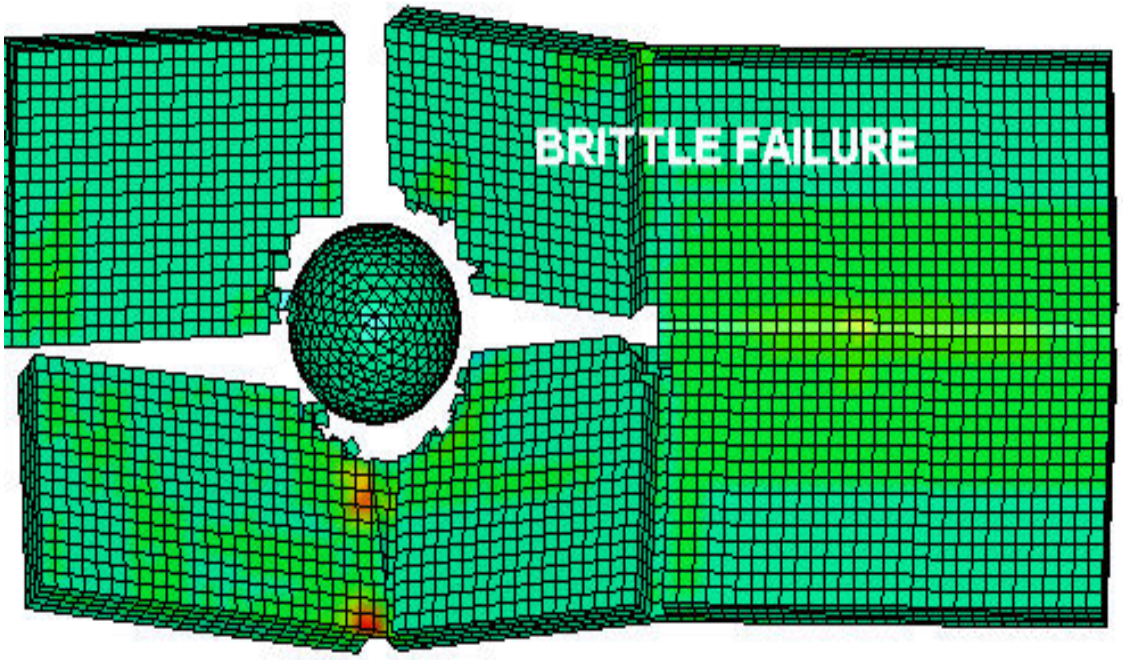
LS DYNA TRAINING

Minimize your experimental work by exploring the most popular and powerful Explicit Finite Element Analysis software to enhance your capability to predict the consequences of a short duration event like impact, crash, or explosion.

Simulate the forming and machining processes in a manufacturing environment or fluid structure interaction and numerous other physical events going all around us every moment. In the real world there is nothing static but the things are in motion and to be able to predict the dynamics of objects with precision gives you an edge over others.



DAY 1

LS DYNA General Introduction

1. Finite Element Method
2. Hydrocodes
3. LS-DYNA , AUTODYN, RADIOSS, DYTRAN, ……
4. High velocity contact
5. Hugoniot Elastic Limit (HEL)
6. Pressure & Volume relationship
7. Wave propagation
8. Speed of sound through various materials (steel=5240, Al=5328, Air=331, Water=1484)
9. Stress waves
10. Material properties at high strain rates

Three stages of finite element programs

1. Pre-Processor (Data Input)
2. Solver (Number Crunching)
3. Post Processor (Viewing Results)
4. LS-DYNA pre-processing
5. LS –PREPOST
6. ANSYS
7. HYPERMESH
8. OASYS PRIMER
9. SOLVER …. LS-DYNA (971)
10. Post Processor
11. LS-PREPOST
12. “K” File (Input File)
13. Editing “K” File using a text editor
14. Editing “K” file using LS-PrePost (Free software from LSTC)

Example 01: Projectile impact on a target plate

1. Introduction to LS-PrePost (2.4 & 3.0)
2. Ls-PrePost Input Pages and their contents
3. Introduction to Page 1, 2, 3, 5, and 7
4. Page 7, 3, and 5
5. Simultaneous introduction to LS-Prepost and “LS-DYNA Keyword manual”
6. Draw a rectangular thin metal plate and a spherical projectile
7. Make PARTs
8. Input material properties and section properties
9. Assign material properties and section properties to the PARTs
10. Input “Termination Time”
11. Input “Time Step”
12. Introduce “Contact” between two PARTS (between Slave & Master)
13. Set “Boundary” conditions (fixing node sets)
14. Assign “Initial Velocity” to the projectile
15. Introduce basic “Database” commands (keywords)
16. “D3plot” file, “Binary_Extent”
17. Execute LS-DYNA (Solve the impact problem)
18. Sense Switches
19. CTRL_C , sw1, sw2, etc.
20. “D3dump” re-start file
21. Post processing the results
22. Display Displacements, strains, stresses, pressure, temperature etc.
23. Display history variables (Strains, Stresses, Energy absorbed, Kinetic energy variations.
24. Printing graphics, making AVI files

Introduction to Important Procedures

1. Introduction to Sets
2. Part set, Segment set, node set
3. Introduction to Boundary
4. SPC_Set
5. SPC_Node
6. Prescribed Motion for rigid and deformable bodies
7. Define Curve
8. Displacement, Linear and angular Velocity, Vector
9. Introduction to Rigid Wall
10. Details of Page 1, 2, 3, 5, 7
11. Gravity loading (Load_Body_Z)
12. Introduction to CONTACT types and their usage

Example 02: Impact and perforation of multiple target plates.

Main Feature: Defining contact between the projectile and the Part set

1. Making a set of multiple parts
2. Introduction to the failure of materials
3. Failure strain in Plastic Kinematic material plate
4. Failure strain is not a physical failure parameter but it is adjusted to the experimental evidence

DAY 2

Example 03: Projectile Impact on a box

Main Feature: Self contact

1. Draw a shell box
2. Draw a projectile
3. Define materials and sections
4. Assign materials and sections to the PARTs
5. Define termination time, time step and initial velocity of projectile
6. Decide plot files interval
7. Define Contact between two parts and self contact for the shell box
8. Solve the problem and post process the results

Important Notes

1. Hourglassing (Non-physical: deformation without strain or stress, Shear Factor (0.833), Control_Hourglass
2. Remedy for hourglassing (Fully integrated elements…..but for explicit they are unwanted)
3. Mesh Adaptivity
4. *INCLUDE
5. *DAMPING
6. SHELL FORMULATIONS (Section Shell)
7. *Control_Energy (Set=2 to have hourglass energy calculated)
8. Shell thickness
9. Equation of State
10. Translate, Rotate, Move/Copy, ElGen, ElEdit, Duplicate Nodes, Normals etc.

Example 04: Projectile Impact on a water filled Can

Example 05: Rotating a Rigid Body

Example 06: Rotating a deformable body

Questions & Answers