Technical perfection, automotive passion.

Side Impact Protection
Agenda

Improved Concepts for Side Impact Protection

Traffic Accidents and Side Crashes

General Characteristics of Side Crashes

Typical Injuries in Side Crashes

Protection Strategy

Protection Devices
Examples

Side Impact: deformation or impact direction is directed against the side of the car
Traffic accidents seized by the police in 2003: 2,259,567
  Of it with injured people: 354,534
  Of it with material damage: 1,905,033
Deaths in frontal crash (Europe): 11,760  lateral crash: 10,500
Accidentology, **Most Common Side Impact Scenarios**

Side Impact: the side of one of the colliding partners is deformed

- Pole Impact
- Intersection Accident
- Motorcycle Accident
- Incorrect Turning
Side Impact, MBS simulation (FMVSS 214)
Injuries

Sequence of contact between structure and occupant (common scenario)
1\textsuperscript{st} contact: door trim to thorax and or pelvis
2\textsuperscript{nd} contact: door trim to legs
3\textsuperscript{rd} contact: head itself hits top roll region of door, or head hits B (C pillar), or goes through window and hits front of striking vehicle

Injuries
Head, very frequent and severest injuries (skull fracture) due to direct contact
Neck, serious injuries are not frequent
Thorax, consequences of rib fractures are a common cause of severest injuries
Abdomen, injuries of organs due to localised loading (liver, splenic laceration)
Pelvis, very commonly injured, mostly fractured (pubic ring, iliac wing fractures)
Lower limbs, lateral bending of femur is frequently observed
Protection Strategy

Demands for Side Impact Protection

Motorcycle Accident
protect motorcyclist

Head Protection
Soften Impact of Head
- Energy Absorbing Device
e.g. Curtain Airbag

Protection of Occupant’s Body
Manage energy transferred at contact
Accelerate occupant and soften impact
Implement energy absorbing devices
Press on seat at the earliest stage possible
Provide best contact between occupant and seat
Provide stiff coupling of seat and floor
Provide lateral stiffness of seat
Limit intrusion of hitting structure (no squeeze)
Limit relative movement of door
Stiffen up door itself
Improve stiffness of pillars and rockers
Protection Devices, Crash Pads

Wood Fiber Crash Pad

Injection Molded Crash Cones

MBS simulation determines properties of parts in an early development stage
Protection Devices, Head Airbag in Door Trim

Side Impact Head Airbag: lid opens outboard to window
Protection Devices, Ripping Behaviour of Foils

Impactor

Sample with laser-weakening

60.0 mm

Velocity km/h

Time Seconds

only substrate A0 (V35, 36, 37, 38)

A4 (V8, 7, 4, 3, 1)

only Foil, B. CrossF 04 (V8, 7, 4, 3)

only Foil, B. oBlack PE 014 (V41, 45)