Experiences from working with ISO 26262 as a supplier SCSSS 2020 Conference

Johan Trollås

Nov 24, 2020 - Nov 25, 2020



Agenda

- BorgWarner in Short
- Experiences from working with ISO 26262 as a supplier
 - Requirements Management
 - Functional Safety Concept
 - Project and Safety Planning
 - Generic Technical Safety Concept



BorgWarner in Short

BorgWarner is a worldwide supplier of components and parts in the automotive industry

Committed to create technologies to improve efficiency, emissions and performance in all types of vehicles

Primary divisions

- PowerDrive Systems
- Transmission Systems
- Emissions, Thermal & Turbo Systems
- Fuel Injection Systems
- Morse Systems

Part of BorgWarner Sweden AB



Hybrid

BorgW

Combustion



BorgWarner in Numbers

~48,000 employees



Locations

Countries

2019 Sales **\$14.5**[°] **Billion** combined

Hybrid

BorgWarner

Electric

Combustion

*Including recent acquisition of Delphi Technologies

ion as of September 14, 2020 Employee and location inform:

BorgWarner Sweden AB Located in Landskrona, Sweden ~ 700 employees

 \bigcirc BorgWarner Inc.



Power Drive Systems Core Products



BorgWarner



BorgWarner

Transmissions Systems Core Products



Experiences from working with ISO26262 and Functional Safety as a supplier





Requirements Management

- A challenge…
 - Various format of requirements from customers
 - Everything from DOORS exports to pdf-files and PowerPoints
 - Several updates during a project
- Extensive work to review and identify relevant requirements
 - Needs to be done in a short period before a quotation
 - Often only a minor part are relevant to the system to be developed
- Level of details in requirements varies between customers
 - Requirements from customer can be very detailed
 - Complicates or replaces the breakdown into sub-system requirements
 - Too detailed requirements may impose a non-optimal design of sub-systems



BorgWarner

Functional Safety Concept

- A moving target...
 - Safety requirements may be limited or not finalized during quotation or start of the project
 - E.g. Requirement may state "system shall be ASIL B" but no information why?
 - Safety concept is evolving during project and may change when gaining more experience from prototypes and testing
 - Including the requirements and their ASIL



Project and Safety Planning

Two different tracks...

- HW design is decided before quoting
 - Is needed to be able to estimate piece price
 - Safety mechanisms are not developed at that time
- Customer project planning and safety planning
 - Not always aligned due to different responsibilities
 - Delays in project plan may not be communicated whereby safety plan is not updated

- The way safety is organized differs between customers
 - For some the safety management is present in the project
 - But may not always understand what system is being developed
 - For others project management acts as a proxy for safety
 - Complicates communication when rationale for requirements or further information is needed
- Different extent of project audits and assessments between customers
 - Even between different projects for the same customer
 - Focus either on process compliance or just on the implementation of technical safety concept

BorgWarner

Generic Technical Safety Concept

A mission impossible...

- Not always possible to design a generic technical safety concept (TSC)
- Customers may have different safety requirements and ASIL for the same type of system
 - Depends on how the system is used in vehicle,
 - Different understanding of potential hazards and their severity, or
 - Weakness of other components in vehicle may cause failures impacting the TSC
- Safety requirements have a major impact when reusing existing system / products in new configurations
 - See examples on next slides...



BorgWarner

All-Wheel Drive (AWD) Systems





Hang On Front (Transfer Case)





Hang On Rear







Summary

- Requirements Management
- Functional Safety Concept
- Project and Safety Planning
- Generic Technical Safety Concept







© BorgWarner Inc.

Hybrid

Electric

Combustion