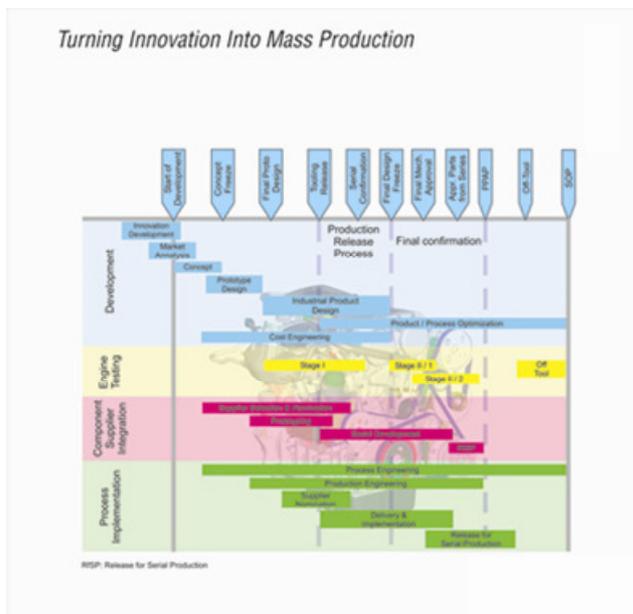


Turning Innovation into Mass Production

The development of the next generation of internal combustion engines has to compromise the increased demands on performance, weight and reliability considering lower product costs. This results in an all-embracing development process from concept to SOP.

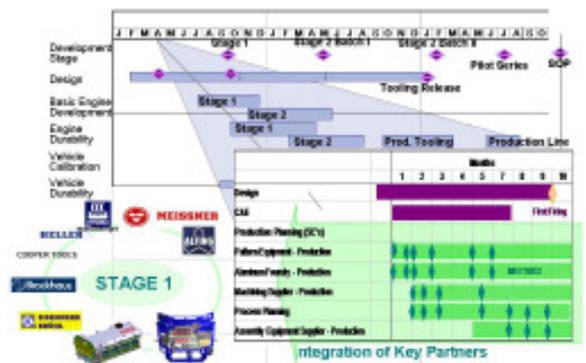


FEV's general role for mass production oriented programs is to strictly follow the measures of the Quality Management systems.

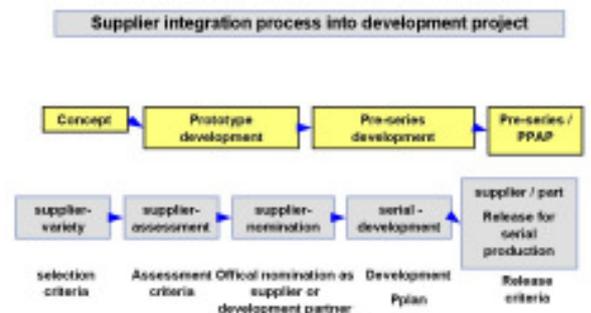
FEV is certified according to: ISO9001: 2000; ISO-14001:2004 and ISO27001:2005. Additionally FEV is following the QS9000, ISO/TS 16949, VDA6.1 and VDA4 procedures.



This concludes that major component and system supplier integration, as well as process planning have to be started as early as possible. Consequently, the purchasing department of the OEM, advanced process planning, production intent foundries and pattern makers, system suppliers, vehicle development, service, logistics, marketing and quality assurance shall be implemented into the development project.

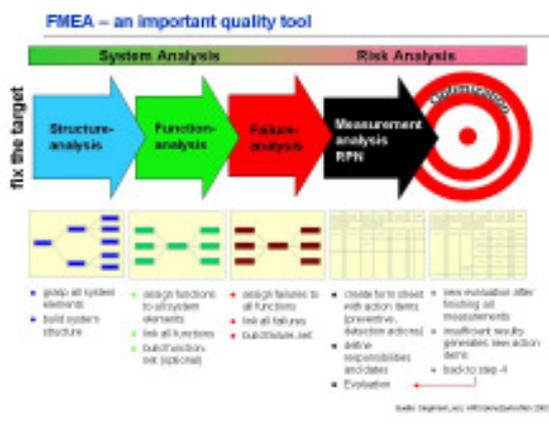


To ensure such advanced and front loaded process, an early start of the component supplier chain management is mandatory. Therefore, FEV has established a specific team with all corresponding activities. A worldwide component supplier data base with more than 100 candidates including Far East, Middle East, Europe and America is available based on practically oriented questionnaires and cooperation.

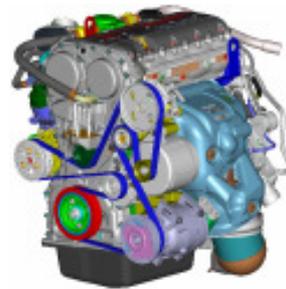
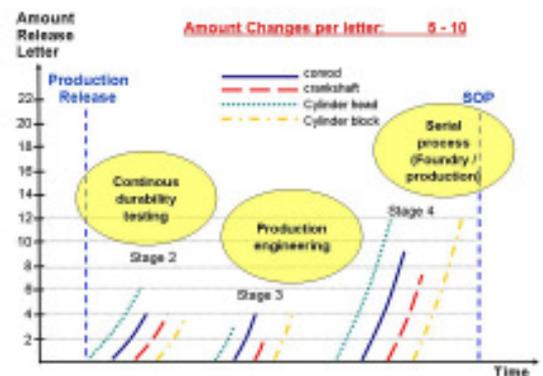


To provide rules for strict communication between all involved parties, a well organized change management (ECN) is necessary. FEV has experience with more than 15 different OEM's within their system. Beside this, an own change management system can be offered, for example, in cases of lean development for niche products.

As a result, the first prototype includes detailed design features that are able to be implemented into mass production (machining and assembly sequence, clamping and fixation and vehicle packaging). Core packs of key components are considering planned foundry equipment and all drafting of forged and sintered components are already agreed with the pre-nominated mass production supplier. From concept phase to SOP, various process tools partly derived from the Six Sigma process are used, including benchmarking, Design- and System FMEA's, Statistical tolerance stack up, and score card considering manufacturing capabilities to achieve the maximum grade of quality.



Within various projects conducted by FEV, it has been demonstrated that the number of changes before SOP could be reduced. Only the final results of production process trials have to be incorporated. This ensures that a functionally stable and durable new product is launched into the market from the first day of mass production.



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