Sustained integration using virtual methods,
taking as an example the creation and testing of the complete vehicle from construction through assembly to the customer service process

1. Question

The **complexity** and **number of derivatives** in car manufacturing grow as **quality requirements** increase. This means that the integration tasks involved in developing the complete vehicle take on increasing significance. Given the high **pressure on costs** and the ever-shorter **time-to-market** situation traditional hardware-oriented development methods no longer fulfil the increased requirements.

From the Golf IV to the Golf V, for example, the number of engine gearbox variants alone has more than doubled. At the same time, assurances on the one hand that all variants can be manufactured and on the other of the ability to do so in an obstacle -free manner are demanded at increasingly earlier stages in the product development process.

As requirements increase within the automotive industry **the possibilities for using virtual techniques** are similarly increasing with regard to computing capacity, visualisation and interaction or immersion. It is therefore no longer a question of whether virtual techniques can be used for the integration tasks involved in developing the complete vehicle, but rather how these can be **integrated in an efficient, sustained and meaningful way into the product development process.**

2. Requirement for sustained integration

2.1 Availability

The hardware and software must be available locally and meet the **required performance and quality** standards. Users must themselves be able to control and drive forward ongoing **maintenance and further development from a decentralised position**. To this end,Volkswagen has set up a VR centre with two sites. Both sites have been built in close proximity to the relevant users and are used in close connection with the corresponding test models.

Moreover, the software in the **operating logic** and in the reports provides optimum support for the user's processes and methods. A continual improvement process is necessary on this point. The implementation of a zone management reporting system is an ideal tool to support the tasks of the geometric integration.

The availability of corresponding data is extremely relevant. A modern integrated **product data management system** (PDM system) is already industry-standard. This enables virtual methods to be used across the board and **relevant staff must be suitably qualified.**

2.2 Integration

Given the assorted nature of the VR landscape there will inevitably be different **data interfaces** in the PDM system. In this regard, Volkswagen has implemented an integrated, flexible conversion tool using the Automation Data Manager.

In addition to data interfaces, Volkswagen has systematically reduced and optimised **process interfaces** enabling production, quality assurance, customer service and development to work together in so-called zone and assembly discussions.

2.3 Acceptance

The building of virtual techniques is supported and driven by user and management. Only with complete acceptance of the results was it possible to use virtual methods in geometric integration across the board.

In order to increase acceptance and optimise methods the results of the VR investigations are tested on pre-production vehicles. By using augmented reality for performance against target comparisons, the boundaries between the virtual world and the real world disappear insofar as the VR world is accessible for all involved.

3. Outlook

Volkswagen will further expand its virtual methods to include integration tasks involved in developing the complete vehicle. In so doing, all physical trials and tests will be investigated for virtual feasibility. Along with the theoretical imaging of a trial, the three aforementioned prerequisites will be tested. Only if all three requirements can be met is ongoing implementation guaranteed.