Accelerating Product Development with Design Events at Michelin

A collaborative solution for efficient product design

By Michelle Cowan

The following information was shared by Jeff Hidde, best practice coordinator at Michelin Americas, at APQC's 2010 knowledge management conference in Houston, TX.

COMPLEXITIES OF TIRE DESIGN

With 68 manufacturing locations in 19 countries, Michelin is the second largest tire manufacturer in the world. It is continually updating tire designs to leverage the best technologies and to meet customer needs. To accomplish this, Michelin designers must consider three complicated sets of requirements: end-user requirements, manufacturing/supplier requirements, and tire composition requirements.

Each tire is uniquely tailored to achieve an optimal balance of comfort, grip, endurance, service life, handling, and rolling resistance specific to the intended use of the tire and its customer demographic. For instance, a tire designed for maximum endurance may have lower requirements for comfort so that its longevity can be maximized. Every tire design requires that different elements be prioritized while striving for the best possible all-around performance.

Those six elements (comfort, grip, endurance, service life, handling, and rolling resistance) mainly reflect end-user expectations. Tire designers must combine that set of requirements with another from the manufacturing plants that will ultimately build the tires. Each plant is equipped to manufacture different sorts of tires and have individual expectations for the cost, the productivity rate, the scrap rate, and the level of standardization associated with manufacturing each type of tire. Again, designers must strike a balance between meeting customer requirements and adhering to the capabilities of the manufacturing plant and business goals or constraints.

In addition to customer and manufacturing requirements, attention must be given to the multiple, complex elements that any single tire is composed of. Figure 1 illustrates just a few of the main parts of a tire that are updated and redesigned on a regular basis as new technologies and customer requirements are discovered. Employees tasked with reengineering the casing ply, for instance, must maintain an awareness of how their work affects the other components of the tire.

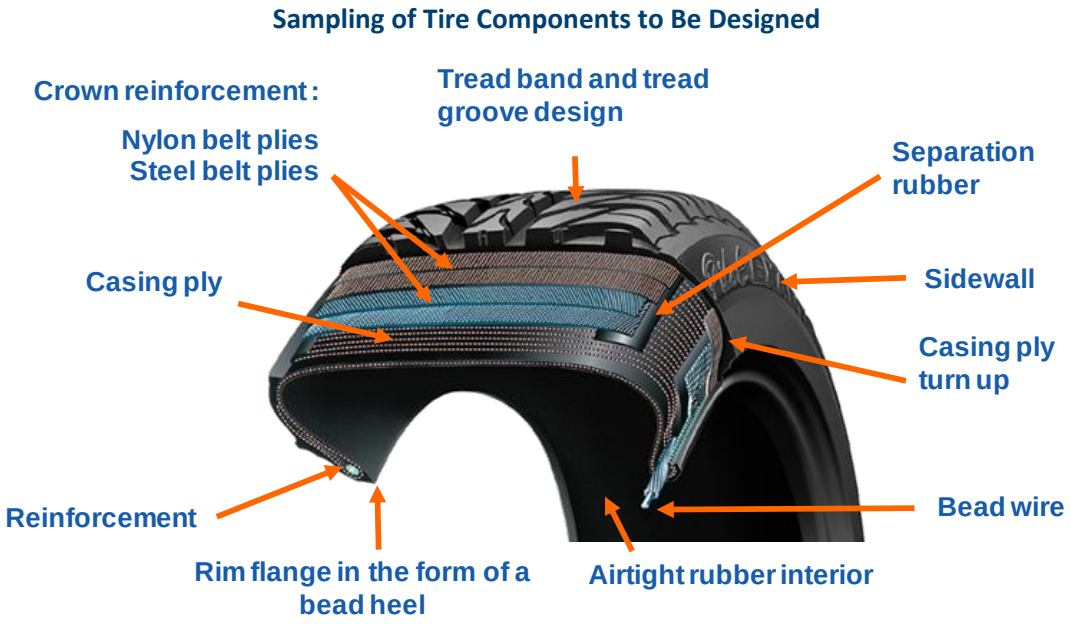

Figure 1

Obviously, no one person designing a particular component of a tire can work in a vacuum to come up with a successful product. To remain aware of end-user, manufacturing, and holistic tire functionality requirements, collaboration must take place.

THE DESIGN EVENT CONCEPT

Every new product at Michelin goes through a three-phase process—from conception to validation to industrialization. Employees begin the process by defining the functional specifications, cost targets, industrial specifications, and a timeline for the new development project. The potential product is then validated and adjusted according to industrial standards through research, analysis, and testing.

For many years, Michelin worked according to a sequential process (Figure 2, left column) that required each member of the design team to work together at different stages and to locate and contact additional subject matter experts as needed. The design process was eventually found to be lagging in efficiency. Too many email exchanges, too many back-and-forth conversations, and too much emphasis on individual activities rather than group goals prompted Michelin to rethink the flow of product development.

To solve these issues, the concept of a "design event" was developed. The design event would bring together experts in each design area to jumpstart individual projects and move through the design process with greater efficiency and more effective communication. The design event takes place after the specifications, cost targets, timing, and business constraints have been determined. Its primary

purpose is to define the new product design and create a validation plan to determination whether the choices as defined will result in the desired end product.

The first attempts at design events were successful, and after coordinators developed better ways to decide and communicate who should be present, what preparation needed to be done, and when to schedule the events, Michelin began using design events as an integral part of the design process in North America. Design events proved to be more efficient than standard processes, and participants reported more satisfaction with the overall design and design process for their products.

Figure 2 compares the standard or previous cycle of product development at Michelin with the cycle as it exists with design events incorporated.

Michelin Design Cycle Comparison

Standard Design Cycle	Design Cycle with Design Event
1. Specifications analysis 2. Design studies 3. Risk analysis 4. Validation plan development 5. Fabricate prototype 6. Test prototype 7. Analyze results 8. Validate design	1. Preparation 2. Design event (incorporates standard steps 1 thru 4) 3. Fabricate Prototype 4. Test prototype 5. Analyze results 6. Validate design
Characteristics	**Characteristics**
• Sequential process • Oriented toward individual activities • Slow • Less robust	• Concurrent process (or compressed sequential) • Collaborative/team-focused • Multidisciplinary • Efficient • Having all skills present for more of the process adds needed rigor

Figure 2

Design events speed the process and act as a design milestone, ensuring that preparatory work is performed on time and that the prototyping phase of the project begins as intended. Bringing experts together has eliminated the waiting and rework that often occurred when individual team members attempted to complete the standard, sequential steps 1 thru 4 without immediate access to other team members. The design events cut down on individual time spent and ensure that more of the total design is taken into consideration from the beginning of the work.

FORMAT OF DESIGN EVENTS

As stated previously, design events are held:

1. to ensure that team members make correct design choices and
2. to develop a validation plan that will minimize the risks associated with the potential product and use resources most effectively.

Before a design event, team members involved in a design project are required to complete preparations as required for the group design event. This means drawing up product specifications, setting time and cost targets, and reviewing business constraints.

After this work has been accomplished, the design event gathers all the necessary disciplines together at the same place and same time to address the constraints and the technical risks that have been identified. Teams follow the following typical design event agenda (Figure 3). The attendees and activities of the events are tailored to the particulars of the project at hand.

Typical Design Event Agenda

I. Initialization
   A. Project overview
      1. Review of targets, deliverables, and timing
      2. Gap analysis
      3. Review of available technologies
      4. Creation of use/manufacturing scenarios (identify studies that relate to the potential scenarios)
II. Discipline studies
   A. Perform selected studies of each component associated with the represented disciplines. Ensure that the technologies being developed or combined will lead to the desired result. Share findings made during preparation.
III. Finalization
   A. Develop new product designs
      1. Review discipline study results
      2. Refine designs
      3. Update risk analysis
      4. Create validation plan
   B. Create work plan
      1. Create prototype fabrication plan
      2. Create resource plan
      3. Identify product/project risks
      4. Determine an action plan
   C. Wrap up
      1. Complete project documentation
      2. Create design event summary
      3. Present design event summary to leadership (sometimes takes place after the design event)

Figure 3

Event coordinators (usually members of Michelin's design management team) issue an agenda for each design event that specifies which team members are required to attend for which portion of the event. Figure 4 illustrates a detailed agenda for part one of the design event (initialization).

Design Event Agenda and Attendance Requirements

				AGENDA: DESIGN EVENT INITIALIZATION					
				Introduction		Review of Available Technologies			Scenario Building
			INITIALIZATION	Opening	Project Overview	Tread	Materials	...	Scenario Building
		Date: Time: Location:							
		Call-in # & PIN :							
		OBJECTIVES &/or DELIVERABLES							
		TOOLS							
Roles	**Participant**	**Department**							
PROJECT TEAM									
	Mr. A			M	M	M	M	M	M
	Mrs. B			M	M	O	O	O	O
	Ms. C			M	M	O	M	O	O
	Mr. D			M	M	O	O	O	O
EXPERTS									
PROJECT SUPPORT									

Figure 4

The structure makes it clear who is expected to attend and what they should contribute. Typically, design events only require members of the design team to attend plus an additional facilitator that is trained to ask probing questions, move and direct the conversation, and ensure that all tasks are completed. The facilitator can be from any department, although design event coordinators try to select facilitators that are familiar with the core elements of the project. Anyone who has completed facilitator training and has availability may be asked to oversee a design event.

SUMMARY

Sequential product design processes that focus on the completion of individual activities can slow overall design progress. That kind of process often limits communication and inhibits team members' ability to share valuable information and, thus, create a streamlined product quickly. Design events solve this problem by combining key design activities into one collaborative event. Participants share expertise and answer questions immediately. Issues with the design rise to the surface and are solved more efficiently, and the prototype is more likely to include all the elements first envisioned. Expert time is spent more effectively.

Design events act as a milestone during product development, ensuring that all team members define and support the product specifications and development plans within a predetermined timeline. Since the institution of design events, Michelin has decreased their cycle time to create new products.

Although Michelin has not yet measured differences in final product quality between products created with and without design events, they have assessed the satisfaction of design team members, who consistently report that they feel their ideas are more appropriately expressed and actualized in design events than through ad hoc email correspondence or question/answer sessions. They report increased satisfaction in the time required of them and in the outcomes of the teamwork.

Design events bring disciplines together to create products that will optimize all the elements required of each unique tire. They also bring prototypes through to testing more efficiently so that manufacturing capabilities can be tested and customers can provide feedback, ultimately resulting in a quicker time to market and a greater likelihood of increased profits.

ABOUT APQC

For more than 30 years, APQC has been on the leading edge of improving performance and fostering innovation around the world. APQC works with organizations across all industries to find practical, cost-effective solutions to drive productivity and quality improvement. We are a member-based nonprofit currently serving more than 500 organizations in all sectors of business, education, and government.

CONTACT INFORMATION

123 North Post Oak Lane, Third Floor
Houston, TX 77024-7797
phone: +1-713-681-4020 or 800-776-9676
fax: +1-713-681-8578
e-mail: apqcinfo@apqc.org
www.apqc.org

