GUEST COLUMNIST

Ten most common mistakes made in powersports' electrical designs

Editor's note: We thought the Powersports Business *edition with a Service Department Focus section was the perfect time to bring on somebody with a manufacturing background. The author, Gary Gustafson, is a former group leader for electrical engineering at Arctic Cat. He's now the president of G-Force Consulting, a company that assists powersports companies with developing electronic and mechatronic products.*

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1. Insufficient charging system power. Insufficient charging power will result in perplexed dealer technicians and more significantly, dissatisfied customers. On the other hand, a maximized charging system can be the foundation for game-changing innovation. For example, the new YEPS available on 2007 Yamaha Grizzly FIs required a 200-watt upgrade to their stator. It is always easiest to specify a high-output magneto charging system when a new engine platform is designed.

2. Not allocating the electrical system design equivalent resources, testing and development as you do your mechanical designs. Powersports OEMS, by and large, have staffs that are 99 percent mechanical in their expertise. Yet the percent of vehicle cost that is electrical is closer to 10 percent, and growing, meaning 1 percent of the staff is responsible for 10 percent of the content. By devoting more resources to electrical development, there is an enormous opportunity for more satisfied customers and product differentiation.

3. Not planning for hose, wire and cable routes. Poor hose, wire and cable routes can cause warranty costs as high as six figures annually and trigger product safety recalls. Powersports OEMs usually design the rest of the vehicle and then make a last-minute demand for their electrical "gurus" to find a place for the wiring to go. Technology exists to modernize this aspect of the design process. Manufacturers can document cable routes either with photos, CAD or, better yet, both.

4. Not designing for serviceability. As much as 60 percent of all electrical warranty is because of poor service procedures. Manufacturers should adhere to a few basic rules for electrical system serviceability. Some of them include: Centralize components into an electrical center, keep schematic diagrams up-to-date and locate electrical connections where they can be reached with minimal labor time. Develop an iron-clad specification for wire colors vs. electrical functions. Continuity in wire color functions will help technicians to grow their familiarity with evolving electrical systems.

5. Not protecting electrical connections. On a powersports product, all DC electrical connections carrying less than ½ amp should be properly sealed, period. ATVs should have waterproofing specifications nearly equal to a personal watercraft. One caveat — most sealed connectors are developed for the automotive industry therefore careful attention must be given to supply-chain management.

6. Not designing for night-time operation. I have taken quads and sleds out for night-time rides and discovered the lighting was so poor that any speed more than 30 mph was a white-knuckle experience. These encounters confirmed to me that design and testing for night-time use should be a mandatory part of the development process.

7. Believing "all electrical parts are the same." Mechanically oriented design and management teams at powersports manufacturers often want to throw everything over the wall to their electrical design staff. If you are having your electrical guy develop something he has never done before, ask him what resources he needs to do his job. It should be viewed no differently than asking a transmission engineer to develop an engine. It might be advantageous to look for temporary engineering help to be sure all of your current and new designs get done properly.

8. Being ignorant of suppliers and costs of electrical components. If a powersports OEM is utilizing an off-the-shelf automotive part or sub-component, it is critical that all parties in the supply chain understand the long-term availability of the part. I am aware of more than one time when an automotive company stopped ordering a part, triggering the supplier to stop making it. Then the powersports company received very short notice that the part number they had built into their design is no longer available. Also, ask for an itemized cost breakdown of your electrical assemblies, such as wire harnesses. Hidden gems of cost reduction will be everywhere — many just for the asking.

9. Locating sensitive components and wires next to electrically noisy devices. Magnetic fields around ignition coils cause electro-magnetic emissions. Aging spark plug wires can induce voltage into other wires capacitively. Many voltage regulator designs are also notoriously noisy. Keep sensitive, low-current signal wires like those on sensors at least 3-4" away from these devices, or utilize grounded shielding on sensor wires if the minimum spacing can't be maintained.

10. Throwing an electrical design to other departments. Many internal departments, maybe all of them, will have to be involved with an engineering design for the project to succeed. Engineering must stay engaged with these other departments to ensure the success of the project. And sometimes to get an internal or external partner to change their ways, you have to make them feel it in their pocket book. PSB