Kevin T. Higgins, *Senior Editor*

What lurks beneath

Biohazards and other contaminants have been out of sight, out of mind under fan shrouds on electric motors. A fabricator of stainless steel motors thinks he has the solution.

John C. Oleson, chief engineer, Stainless Motors Inc., Rio Rancho, NM.

Mechanical efficiency takes a back seat to food safety in today's production environments, a reality that is driven home by the stainless steel motor. Carbon steel dissipates a motor's latent heat much more efficiently than stainless, yet some industry segments have all but standardized on stainless motors, particularly in high-pressure washdown environments. As a consequence, virtually every motor supplier to the food industry includes stainless motors in its catalogue.

With a 24-year track record of stainless motor fabrication, Stainless Motors Inc. is unquestionably a pioneer and has grown along with the category as stainless motors expanded from a niche product for pharmaceutical manufacturers to mainstream food production. While some end-users assume stainless motors support their food safety programs, significant contaminant buildup can occur under the fan shrouds. Seizing on an improved-hygiene opportunity, Stainless Motors' founder, president and chief engineer, John C. Oleson, turned his engineers lose on re-engineering the fan assembly to deliver a sanitary cooling system to the industry. Dubbing it Sanifan technology, Oleson and his team recently started rolling out the new design.

Oleson graduated with a degree in mechanical engineering from California Polytechnic State University in San Luis Obispo before working as a design engineer in the Los Angeles area. He started Stainless Motors in 1988, and was the first company to engineer and offer stainless steel motors to industry. Customers quickly demanded stainless steel gear reducers as well. His factory has operated in the Albuquerque, NM area since 2003.

FE: What prompted you to incorporate a sanitary fan design in stainless steel motors?
Oleson: One of our customers is very concerned with sanitary design, to the extent he only allows hex-head screws on a motor, no flatheads or anything with a crevice where microbes can reside. A shroud covers the motor fan, which is mounted to the motor's endbell, and huge volumes of air are blown over the motor's body to cool it by the fan. There may only be a few particles in a cubic foot of air, but over days and weeks, that can build up under the cowl in an area that isn't visible. I thought somebody ought to address this. Last November, we decided to do it.

FE: Isn't sanitary design the entire justification for stainless steel motors in the first place?
Oleson: The industry originally went to stainless steel because of corrosion issues. The mission was to make a motor that would survive in a washdown environment. No one was looking at particle buildup under the shroud. It's been kind of an open secret for a long time, but no one had addressed it until now. There are a number of long-lasting, reliable stainless motors on the market, but this is the first that addresses sanitation and cleanability under the shroud.

FE: Are there any documented cases of airborne contaminants coming from a motor on the production floor?
Oleson: When a plant has a contamination event, the typical response is to take everything apart, clean all the equipment thoroughly, then test to see if the contamination was removed. Many times, a definitive answer to the question of where the problem originated isn't found; they just know that, from intensive cleaning, they got it. With this design, we're removing the motor as a potential source.

An electric motor provides a warm environment for bacteria. When you clean, you usually introduce water for their growth, so the potential is there to spread microbes throughout the plant.

Biofilms and other contaminants often lurk under an electric motor's endbell, undermining the sanitary design. A New Mexico engineer is addressing the issue with wet and dry versions of his stainless steel motors. Cutaways of the dry cooling fan assembly and wet sanitary fan showcase changes such as the stainless fan that replaces a plastic unit and the blind-tapped, polished nut. Note the holes in the wet fan's endbell, which allows cleaning solvents to exit the endbell. Source: Stainless Motors Inc.

FE: Did you consider a quick-release, tool-less connection to facilitate removing the shroud and accessing the fan for cleaning?

Oleson: We could have added thumbscrews or some other mechanism. The problem is that we live in an OSHA-controlled world. If someone takes off the cowl and fails to put it back after cleaning, the rotating fan becomes a danger, and the liability for any injuries would come all the way back to us. You don't want to lock out, tag out every time the fan is cleaned. That led us to this design concept.

FE: So, how do you prevent particle buildup on the fan and endbell?

Oleson: Two fan assemblies were developed, one for wet applications, the other for dry. Common to both is a polished 304-stainless fan with a tapered shaft that eliminates crevices. The fan is secured with a blind-tapped, polished stainless nut. An EPDM gasket between the fan and the nut eliminates a metal-to-metal crevice. A specially designed elastomeric slinger/seal on the back side of the fan eliminates metal-to-metal interface between the fan and endbell; it also shields the mechanical shaft seal from large particles. Four EPDM shroud standoffs eliminate metal-to-metal contact between the shroud and the endbell. USDA inspectors want to see that elastomeric interface between the metal surfaces to prevent microbial growth.

With the dry fan, cleaning solutions can be sprayed through the shroud to wash down the fan area. With the wet design, pressurized water can be sprayed through a port on the endbell, which has holes on the outer wall and is solid on the inner wall. Sanitizing water exits the endbell through those holes. Cleaning solvent also can be sprayed through the shroud to wash the fan area, without penetrating to the endbell.

FE: What issues arose during the development phase?

Oleson: As with any R&D project, after you envision a solution, you build a prototype and go through numerous iterations with the various components. For example, the size and shape of the holes and slots on the shroud and the endbell for wet applications went through numerous changes until we came up with the optimum size and pattern. The elastomer membrane also was a challenge. You might think you just order an EPDM gasket and put it in, but it required some special designs and the right flexibility to keep it from being crushed between the shroud and endbell.

The biggest challenge for Andrew Cook, our engineering manager, and the team of four engineers assigned to the project was ensuring the shape and outer dimensions of the motors did not change. We make close to 2,000 different models of motors in NEMA frame through 326T and IEC frames through 200L, and the team had to design and redesign all of them to accommodate the sanitary fan. There has been more investment in the development of this technology than what went into the first stainless steel motor we built in 1988.

FE: When will food manufacturers be able to assess the new design?

Oleson: The castings for new components began arriving in early August. By the end of summer, we'll start shipping motors with the dry endbell. Originally, I expected dry motors would be 90 percent of the installations, but one customer indicated he expects to purchase 90 percent wet units. We really don't know how the industry is going to respond, but we're gearing up to build both. And because it's a drop-in for existing motors and does not come with sticker shock, we think it's going to have as dramatic an impact on the industry as the original stainless motor.

FE: You have complained about knock-offs of your stainless motors and once said of patents, "Unless you have $1 million to defend a patent, there's no point in getting one." Will you be able to defend the sanitary fan design?

Oleson: Early this year, we filed for patent protection that has now successfully gone through preliminary review. We're confident we'll be awarded a patent, and we will aggressively enforce it from the day it was pending. We're not getting copied again. ❖