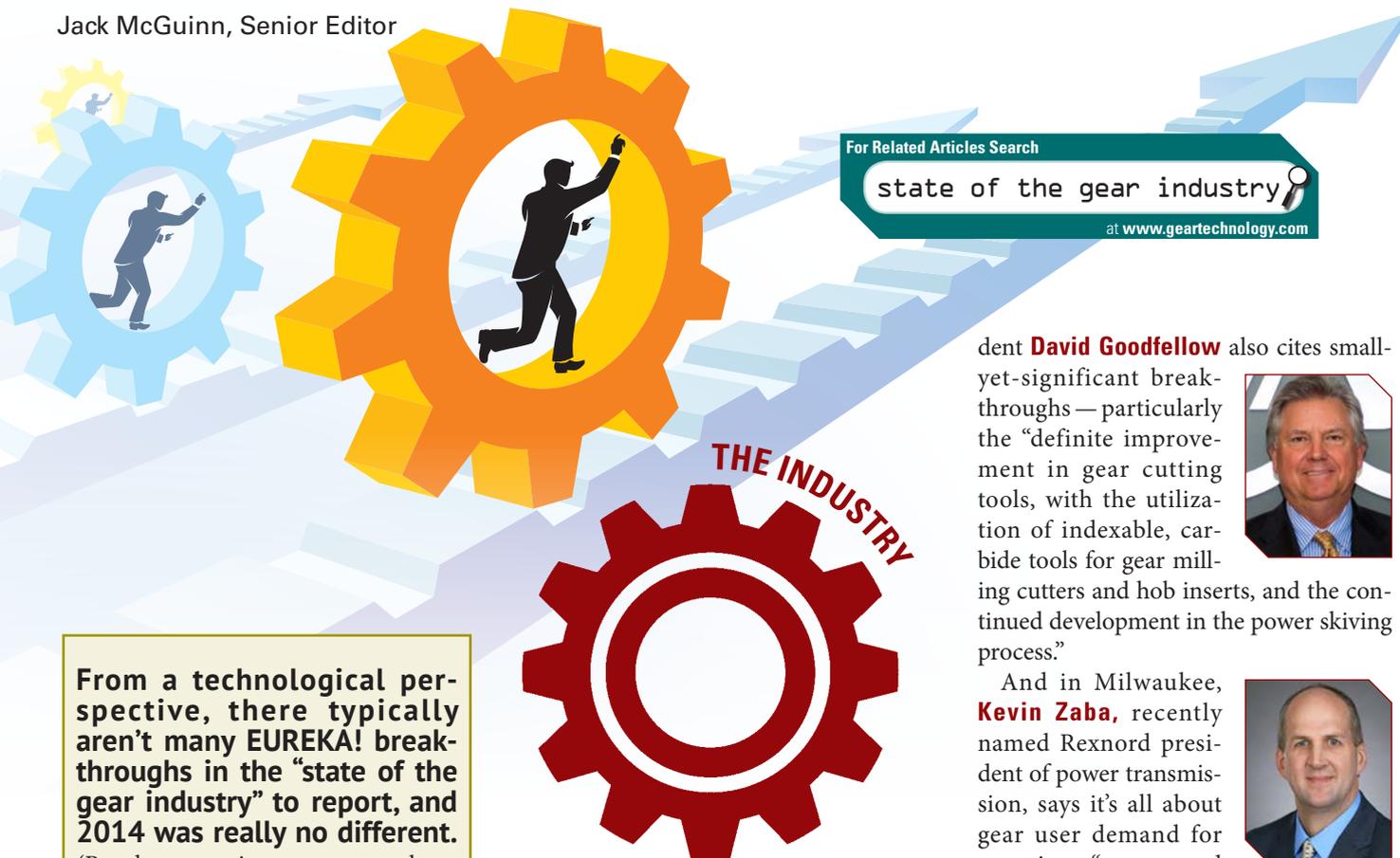


2015: MORE OF THE SAME

But no one's complaining

Jack McGuinn, Senior Editor



From a technological perspective, there typically aren't many EUREKA! breakthroughs in the "state of the gear industry" to report, and 2014 was really no different.

(But there *were* improvements; please read further). On the dollar-and-cents side of the equation, however, most gear industry players should be reasonably content over how this past year shook out — and are at least guardedly optimistic about the next. Our yearly State-of-the-Gear-Industry Survey (Page 28) bears testament to that. What follows here are some insights from gear manufacturers, suppliers and other industry insiders — and their take on how things look for 2015. We'll follow that with snapshots of U.S. gear research (OSU GearLab); workforce stability (apprenticeship programs); and women in (gear) engineering.

That gearing is an industry with deep age lines is unquestioned; just one example: Gleason Corp. celebrates its 150th year in operation this June. But "still water runs deep," as the adage goes, so age notwithstanding, there is *always* something new going on in the world of gears, and 2014 was true to form. Technology improves and upgrades continue occurring in meaningful — if incremental — ways in various areas in the industry. Like, for instance, on the machinery side, as reported by **Al Finegan**, director of marketing for Gleason Corp. "(Our) industries are relatively mature, and technology advancements tend to be evolutionary, rather than revolutionary. With respect to gears, advances generally center about improvements in gear design, gear materials, tool materials, and processing." Star SU presi-



dent **David Goodfellow** also cites small-yet-significant breakthroughs — particularly the "definite improvement in gear cutting tools, with the utilization of indexable, carbide tools for gear milling cutters and hob inserts, and the continued development in the power skiving process."



And in Milwaukee, **Kevin Zaba**, recently named Rexnord president of power transmission, says it's all about gear user demand for creating "more and



more torque transmission from smaller gear drives." Zaba says this "trend" is creating a welcomed ripple effect that is "driving the development of innovative gear tooth coating and finishing techniques that haven't been required in the past." And "Rexnord is responding to those customer needs."

Looking at the Big Picture, it seems to be ever more difficult for gear industry manufacturers in particular to sustain their relevance in this New World Economy — especially given the ever-tougher demands of customers.

Goodfellow responds to that premise with "The biggest challenge is the continued improvement in accuracy and quality requirements, while still maintaining higher productivity values."

For AGMA president **Joe T. Franklin Jr.**, "Sustained relevance" comes from constantly challenging yourself as a manufacturer, con-



stantly insisting that your employees are well-trained and well-educated, making sure that your manufacturing equipment is capable of producing products your customers need and that relationships with your customers have reached an advanced stage where you truly are partners.” Franklin adds that the process is aided by the industry’s system of standards, created by industry volunteers.

At Rexnord, Zaba echoes the importance of standards “Rexnord’s support of AGMA is steadfast and (in fact the company) participates in standards-writing committees with AGMA and ISO in order to shape the intent and use of standards and principles.”

Closing this one out, Finegan’s answer is classic, textbook Business & Marketing 101 in its clear-eyed understanding that, at the end of the day, it is all reduced to: Quit whining. The customer is always right. End of story. “Sustained innovation is the key to maintaining sustained relevance. Citing the imposition of tougher standards by governments or blaming customers for being more demanding will accomplish nothing. Customers can be demanding, but only because they too are subject to the same tougher standards and their customers are demanding. It’s today’s business world.”

Of keen interest to many on the automotive side of gearing are impending stiffer, government-mandated curbs on CO₂ emissions. In 2012, the U.S. Department of Transportation and the EPA issued new rules for corporate average fuel economy (CAFE), which set much more stringent requirements for U.S. automobile manufacturers in terms of their vehicles’ energy efficiency. These mandates have led to the design and manufacture of more and more complex transmissions. The result is that over the past few years, we’ve seen a steady increase in the number of gears in automobile transmissions, and that trend looks to continue.

“(Such) transmissions are already in North America and actively in use,” says

David Zini, GM gear system design and development/global technical specialist. “GM is aggressively rolling out 8-speed automatic



“The biggest challenge is the continued improvement in accuracy and quality requirements, while still maintaining higher productivity values.”

David Goodfellow, Star-SU

transmissions in the Corvette, Cadillac models, and Chevrolet Silverado and GMC Sierra full-size trucks (and) 9- and 10-speed automatics are in our future. GM is continuing to develop new technology for future applications that is optimal for CO₂ emissions.”

Franklin reveals that, “Based on the report presented by Brett Smith of the Center for Automotive Research to AGMA, the EPA and the automobile industry are moving aggressively to meet new standards that will require significant reductions in CO₂ emissions in coming years.” He says a paradigm

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“Customers can be demanding, but only because they too are subject to the same tougher standards and their customers are demanding. It’s today’s business world.”

Al Finegan, Gleason Corp.

shift is in the offing for “those of us who (were looking) for ways to conserve energy resources by increasing miles-per-gallon.”

Automobile transmissions with more gears means more gear manufacturing and continued work for the gear industry. By all accounts, the automobile industry has been a bright spot and should continue to drive gear industry growth. But this report would not be complete without a brief look ahead to Gear Expo 2015, convening in Detroit’s Cobo Hall. So we asked about expectations.

“At the moment, the U.S. economy is reasonably healthy, and manufacturing is making a modest resurgence,” allows Finegan. “That being said, Gear Expo is a highly focused show that serves a finite market, so one cannot expect off-the-chart attendance figures.” Star SU’s Goodfellow is looking “to see the same enthusiasm at next year’s Gear Expo on the heels of strong automotive production.”

As for the event’s host, “AGMA has high expectations and, more importantly, so do our exhibitors,” says Franklin. “At this point the show is 85% sold. We are developing an expanded education program that should appeal to both manufacturers and users of complete drivetrain systems.” Venue-wise, “We have followed the (redevelopment) of the downtown area and are quite confident that visitors will be met by a friendly and safe city, (including) a revitalized Cobo Hall — with new management.” Without prompting, Franklin candidly allows that “Detroit continues to have challenges... but if the (Cobo) success is any example, we should all have great optimism for the future of Detroit.”

And speaking of optimism, it’s time for the last BIG question — what to expect in 2015. *Spoiler Alert:* it’s stay the course and keep on keeping on. In their own words:

Finegan: We expect to see some modest improvement in 2015, which is probably in line with the broader machine

tool market and the economic projections for most major industrialized countries.

Goodfellow: We believe 2015 should show some improvement in other manufacturing sectors such as construction, truck and tractor and agriculture; 2014 was mainly driven by the U.S. automotive industry.

Zaba: We’re anticipating market conditions in 2015 similar to this year. In 2014, we’ve seen increased market demand for more torque-dense drives and larger drives. We’ve also seen trends and interest regarding our product quality and reliability, services, and ease of doing business. One of our top-selling products, the Falk V-Class, is continuing to expand in size and scope while penetrating new markets and applications.

Zini: Better. Our gear manufacturing and supplier base is more streamlined than ever, and we’re able to provide the best products we’ve ever made.

Citing recently received data from AGMA economic counsel IHS Economics Group, **Franklin** reports that “Demand for gears in the United States fell nearly 9% in 2013, and they (IHS) anticipate growth of slightly more than 1% this year.

“The good news is based on an analysis of customer industries, as well as the broader U.S. economy; they show demand for gearing in 2015 growing just under 6% and in 2016 approaching 7%.

“The industry sectors showing the greatest potential in the next two years include manufacturers of electrical generating equipment, machinery such as machine tools, material handling equipment, industrial machinery, aerospace, and construction. The only negatives in the next two years are for manufacturers of farm machinery in 2015, and railroad equipment in 2016. So, we should all sing along with Little Orphan Annie as we watch the sun come out tomorrow.”



Broadway hit musical references aside, forget for the time being all about a maturing industry or artifacts-in-amber inferences.

For at The OSU GearLab — headed up by **Dr. Ahmet**

Kahraman — things are popping — and have been for some time now; hardly a sign of an industry in total stasis.

OEMs of various stripes continue beating a path to their door — dollars in hand — seeking answers, breakthroughs or improvements on any number of gear-related issues — some with far-reaching impact.

Consider again those government-mandated CO₂ reduction standards vis-à-vis multitudinous-gear vehicle transmissions. The OSU GearLab has certainly not been sitting on the sidelines. Indeed, “Gear and transmission efficiency have been a very significant portion of our research portfolio for the last decade,” Kahraman affirmed.

“We have developed physics-based, mechanical power loss models for spur, helical and hypoid gears based on elasto-hydrodynamic lubrication theory. Some of these models are implemented in our *LDP* and *HAP* software programs, which allow our consortium sponsors to do such predictions. We complemented these models with spin loss models for gears and bearings. Combining all these models, we were able to develop manual- and dual-clutch transmission, planetary gearsets and rear-axle efficiency models for various companies. We also invested heavily on experimental studies of gear efficiency and developed extensive databases for model validation. (What’s more), “we have published more than 20



journal articles on gear efficiency since 2010.

“GearLab is in a very healthy position; its growth has been steady and robust for the last 10 years,” Kahraman confirmed, pointing to “more than 70 fee-paying members to our Gear Research Consortium, including most OEMs and first-tier suppliers from automotive, aerospace and heavy-vehicle industries.”

The Lab’s solo-sponsored research portfolio and its experimental research capabilities are flourishing as well, said Kahraman, citing its Pratt & Whitney Center of Excellence of Gearbox Technology partnership and the purchase of “a dozen state-of-the-art test set-ups, machines and measurement systems.”

As for what’s new in the GearLab’s world? “I can’t speak for the gear industry, but we invested significant effort to developing models to design and analyze spline joints to the levels of sophistication as gears. Our sponsors are very excited about our *Spline-LDP* software, as well as our second-generation spiral bevel and hypoid contact analysis model *HAP*.”



In the January/February 2014 issue of *Gear Technology* we did a story on apprenticeship programs – or the lack of them – in the U.S.

For decades apprenticeship programs were a reliable feeder component adding to the steady flow of qualified workers that kept the country’s manufacturing houses humming. And then around the early 1970s — when it seems just about *everything* went to hell one way or another — poof! — no more apprenticeship programs. But they’re coming back — at least in some parts of the country — especially the Pacific Northwest, i.e. — *aerospace coun-*

try. That’s where the Aerospace Joint Apprenticeship Committee (AJAC), assisted by **Lisa Van Dyke**, marketing communications manager works the trenches daily in partnership with a consortium of willing and eager aerospace and other hi-tech-type manufacturers in recruiting and retaining candidates for what is surely one of the most successful apprenticeship programs in North America.



We asked her how are things going at AJAC since we last talked. After all, with what seems like boatloads of folks preparing for Mars colonization, aerospace must be hot and in need of even more trained workers.

Indeed, “AJAC has sustained a 44% increase in the number of apprentices between 2013 and 2014,” Van Dyke reports. “Likewise, the number of registered Training Agents (AJAC participating employers) increased by 54%, (highlighting) the booming demand for apprenticeship training in aerospace and manufacturing occupations across



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Washington State.” (Source: AJAC 2013-2014 Summary Report.)

Van Dyke adds, “There is (also) a strong interest at the federal level, (given the) surge in federal dollars (for) job-driven training.” In fact the U.S. Department of Labor has ponied up \$100 million in American Apprenticeship Grants (who knew?) to incentivize partnerships that facilitate getting more workers into apprenticeships.

Van Dyke believes that “This competition will help more Americans access this proven path to employment and the middle class, i.e. — 87% of apprentices are employed after completing their programs, and the average starting wage for apprenticeship graduates is over \$50,000.” (Source: AJAC 2013-2014 Summary Report)

This, she says, dovetails with a simple fact of 21st century life that — proud mothers and fathers notwithstanding — a growing number of young people are starting to realize, i.e. — that “the four-year college degree is not the only path to a successful career after high school. They are learning that apprenticeship offers high school graduates an avenue to train for a career while earning a paycheck as well as a degree — but not racking up debt at the same time.”



Women in engineering — unlike peace in our time — is not as rare an occurrence as you might think.

But women in *gearing* — now *there's* a subject that bears some scrutiny. Because let's face it: dating from whenever it was, exactly, that the first gearset was improvised — the fairer sex has definitely gotten the short end of the addendum.

But no longer — and we have two worthy representatives on record here to

tell you why: **Robin Olson**, sustaining engineering manager/gear group, Rexnord Corp., and **Jane Muller** of Geartech.



Jane Muller's supervisory skills were developed at an early age, as a look at this job site clearly demonstrates.

Not unlike the boys on the block, both women had to know how things worked at an early age — regardless of their inspiration.

“My parents are the type of people who develop an interest in a topic and then seek to learn as much as they can about it,” says Olson. “When I was young, there was always a Heathkit project or box of old radio parts somewhere in the house. In fact, my dad built our first computer — the Heathkit H89.”

Muller “was always interested in how things work,” copping to having “many non-traditional girl toys, including trains, cars, Legos, erector sets, and Lincoln logs. I wanted to take (high school) shop, drafting, or woodworking classes, but was not allowed.”

In becoming an engineering gearhead, there was no dramatic epiphany, but more of an evolving. “I was convinced I wanted to program computers until I took physics as a junior in high school,” Olson conceded. “That got me interested in forces, motion, and energy; I selected marine engineering as a (college) major.

As for Muller, she was a twenty-something working as an assistant in the occupational therapy department of a large hospital in San Francisco. With her learned mechanical skills a major asset, she “became the person who fixed equipment and created adaptive devices for patients.” Having also “worked with amputees using then-state-of-the-art myo-electric prosthetics,” one thing

led to another — including a fateful conversation with a colleague — and “within weeks, I had applied to San Francisco State University (SFSU) and was accepted. I had no inkling of what I was getting into. The SFSU engineering department was a unique environment; there was a peak in enrollment of women in engineering at that time and there were many older re-entry students with very diverse backgrounds. I felt I had the support of other students and the instructors and staff. However, there were some instances of discrimination and inappropriate behavior, based on gender and ethnicity. For my part, I either handled these situations personally or worked my way around them.

“Trail blazers” — whatever the “trail” — are often in for a rough ride. Women breaking into male-dominated industries are often no exception, and do so at risk of humiliation and or failure if not given a fair shake to succeed. But not these two, apparently. Take workplace hazing, for example.

“If I have (been hazed), I've never noticed it,” said Olson. As long as someone is willing to listen, learn, and contribute their ideas, gender hasn't been an issue.”

While for Muller, “Working in geriatrics with mainly male patients, I believe that background, and my empathetic nature, have made working in a male-dominated field easier. (But) there have been a few instances of harassment during my work career. Some of these I handled myself by remaining professional and successfully defending myself with technical arguments. One instance, at a factory in Europe, was dealt with by the co-workers of the inappropriate person, and the matter was resolved to my satisfaction. In another instance, my employer stepped in and action was taken by the supervisor of the person involved. The matter was resolved to my satisfaction.

And what of job interviews? What were those like?

“They get easier with experience,” says Olson. “I remember one where I was asked, “You have heard of thermodynamics, haven't you?” It was right after college and my resume was very thin.”

I've been able to add some accomplishments since then.

It has been different for Muller — in a good way. “My work situation is, and



“That need for a mentor is continuous in a technical career; as we grow our experience, we seek out advice from others who have already had those experiences.”

Robin Olson, Rexnord Corp

always has been, unique. I maintained contact with a few of (my) professors. I approached (former SFSU professor) (and longtime *Gear Technology* Technical Editor) Robert Errichello for advice on job hunting. At the time, he needed immediate part time help, so he hired me on a very temporary basis while I searched for a full-time job. That was >30 years ago. Therefore, I was spared the stress of the job interview process.

Mentoring is a priceless form of on-the-job “coaching” that is hard enough to find today for even the sharpest young lad on the floor. With so few women in the gear world—in either the executive or hands-on part of the business—it has to be even tougher. Unless you get lucky; both of our subjects would be the first to say they got *damn* lucky.

Olson: “I am fortunate to have started my career at Falk. When I started, Falk

had one female engineer and she had been with the company for around 30 years. I was hired as her understudy and the mentoring came with the job. My boss at the time,

Mike Antosiewicz, also put me on projects that interacted with some great gear engineers at Falk and in AGMA—people like John Lisiecki and Don McVittie*. I asked a lot of questions and they were all willing to share their knowledge. That need for a mentor is continuous in a technical career; as we grow our experience, we seek out advice from others who have already had those experiences. (**The late Don McVittie was also a longtime Gear Technology Technical Editor.*)

“Friends and mentors are indispensable—while in school and during your career,” says Muller. “Mentors inspire you to grow and continue learning. I would suggest looking for people who are eager to join group projects or are willing to volunteer for special projects. If you have a specific interest, find a person who is interested in that subject.

Determine if they have a history of mentoring and talk with them.”

And when asked if they’d recommend a career in mechanical engineering to their daughters, nieces, nephews—whomever—well, you know their answer.

“Yes, absolutely!” said Olson. “In order to innovate, we need to get young people interested in technology and make it rewarding for them to participate in engineering careers. My experience in engineering has been positive because previous generations of female engineers and scientists paved the way. I admire their perseverance and courage.”

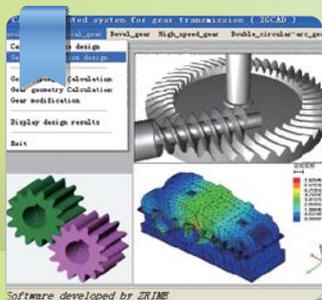
“I would never hesitate to recommend engineering as a career choice,” Muller concurs. She in fact volunteers at a children’s science museum where they hold annual women-oriented STEM events in all areas of science, technology, and mathematics. Muller led a session on gear failure analysis last year and “had a large turnout of interested girls. This year I’m planning to do a Geartech vendor table and hope to reach a larger cross-section of girls in a different venue.” 

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