INSIDE INDUSTRY

By: DAVID J. COX
Past President
NIA

Mechanical insulation: The sustainable choice

We all know these kinds of people: the quiet, unassuming ones who like to remain out of the spotlight yet demonstrate dependability, effectiveness, know-how and success in all that they do. Now, let's apply this analogy to the systems of the built environment, or aspects of our surroundings that are built by humans. Mechanical insulation is a system that is often forgotten, yet it is truly the star of the show. It is quiet, unassuming, efficient, dependable, reliable and smart. Additionally, if protected and properly maintained, this system can significantly reduce energy consumption, reduce your carbon footprint and contribute to environmental sustainability.

Recently, I was up in my attic and was struck by my quiet insulation, which I had added back in 2013. I needed and wanted more attic insulation at the time, so I added more blown-in fiberglass, bumping the resistance (R) value up from an R19 to R60+. The utility savings are about 20–25% per month, and the quiet and unassuming insulation has been doing its job in my attic for over a decade — helping Duke Power and Columbia Gas reduce their power generation requirements. In my small way, I will move the U.S. closer to the Biden administration's goal of making the electricity sector carbon free by 2035.

I thought about how attic insulation is truly a "Set it and forget it!" proposition — until it's disturbed in some fashion. Over the years, we've had to redo the wiring in the attic on two occasions. The workers commented on how hard it was for them to work in my attic because the insulation was so deep. Both times, the insulation was damaged during the work, and I went back and blew more insulation into the attic.

My attic is a small example of the more significant problem with missing or damaged insulation in industrial and commercial facilities and plants. We, in the mechanical insulation industry, see an opportunity to collectively make an impact on carbon emissions in a very simple way — repairing or replacing missing or damaged insulation. Missing or damaged insulation refers to insulation that is not properly installed or has been removed or damaged over time, leading to energy loss and increased carbon emissions. Studies have shown that up to 30% of the insulation installed in the built environment falls under this category, providing great opportunities for improvement. Insulation systems require periodic inspection and maintenance to ensure they are functioning optimally. While inspection and maintenance are the responsibility of the owner, many insulation systems are frequently ignored, leading to significant energy waste and environmental impact.

One new government program will impact the maintenance of, and demand for, mechanical insulation. In March 2024, The U.S. Securities and Exchange Commission adopted rules stating that public companies must disclose their GHG emissions (Scope 1 and 2) in 2026. This will undoubtedly drive demand for maintenance and inspection of insulation systems to ensure they are working as intended.

A second potential driver of mechanical insulation demand is the Inflation Reduction Act (IRA). The IRA will make hundreds of billions of dollars of tax credits available to companies building facilities or producing clean power and materials. The twist is that the energy tax breaks are transferable from developers of renewable projects to the buyers who help fund renewable energy projects. Recently, solar energy panel company First Solar sold $700 million in tax credits to Fiserv. According to Credit Suisse, the market for these credits is estimated to be over $500 billion through 2030.

EPA data shows that 60-80% of total energy consumption from manufacturing plants comes from process heating and steam systems, so it is imperative that those systems are correctly insulated. Insulation works, and the cheapest form of energy is the energy you don't use in the first place. Remember, with energy, you can reduce before you produce. Our trade association is exploring ways for our quiet and unassuming mechanical insulation to offer value in tax credit markets and play a more prominent role in utility rebate programs thanks to its potential savings in both dollars and emissions.

For more information, visit insulation.org. ●

GUEST ARTICLE

By: ANGELICA PAJKOVIC
Client Specialist
Teadit

By: CHRIS MORRIS
Sales Engineer
Teadit

Spiral wound gaskets: Innovations in efficiency

The evolution of the spiral wound gasket, and its standards, is indicative of the potential for increased efficiency and asset reliability in the industrial sector. With a long history of innovation, spiral wound gaskets have emerged as essential, not only for the total cost of ownership but also for the ongoing effort to minimize emissions in the pursuit of a net-zero economy. Proper application of these assets can bring the industry closer to achieving a safer and greener tomorrow.

In 1867, George Babcock and Steven Wilcox patented the first steam-generating boiler. As boiler technology advanced, it became evident that effective seals were crucial for minimizing energy loss and maximizing steam-generation efficiency. In 1912, the spiral wound gasket was developed by alternating plies of metal with fiber filler to meet increasing pressure-resistance demands.

The 1940s witnessed the introduction of designs employing "soft metal" fillers for high-pressure applications, along with early concepts for inner rings to reinforce gaskets against radial buckling. Subsequently, the 1960s led to new materials such as PTFE and exfoliated graphite as alternative filler materials.

However, the evolution was not confined to spiral wound gasket technology alone. As boiler technology advanced, the need for oversight and standardization grew. Many aspects of modern standards such as ASME B16.5 and B16.47 for pipe flanges, ASME B31.3 for process piping and ASME Boiler and Pressure Vessel Code Section VIII for the design and construction of pressure vessels were developed at this time.

With the development of standards for boilers and pressure vessels, additional considerations were made for the gaskets integral to their efficient operation. Through the 1940s, the American Standards Association (ASA) incorporated the existing API benchmarks into its standards, culminating in the approval of a new standard, ASA B16.20.

By its final edition in 1988, the API standard had expanded to include spiral wound and jacketed gaskets, along with ring joints. In January 1993, the new ASME B16.20 Metallic Gaskets for Pipe Flanges standard was introduced and subsequently approved by the ANSI as a national standard.

The earliest version of the B16.20 standard was a dimensional standard and gave little direction on gasket construction. This meant that individual manufacturers had to determine the construction of the winding element, leading to significant differences in performance across the industry.

For most of its history, the only "performance" consideration within the B16.20 standard was compressibility. The standard's wording and methodology ensured that the gasket sealing element would compress to the outer guide ring when subject to a prescribed load, based on the gasket size and pressure class.

A research paper presented in 2017 by Jose Veiga, former global technical director with Teadit, and David Reeves, former president of Global Downstream and Chemicals with Chevron and well-known bolting and sealing expert, titled "ASME B16.20 Spiral Wound Gaskets Performance Testing," (PVP2017-65371) highlighted the importance of controlling winding density. It showed that by controlling the winding density — the ratio of metal to filler — across all sizes and pressure classes, spiral wound gaskets could achieve and maintain a tight and reliable seal. This marked a departure from the prevalent "soft windings," which allowed for over-compression, thereby transferring the sealing load to the outer guide ring which is a non-sealing element.

As a result of the research, a performance test was adopted into the 2017 edition of the ASME B16.20 standard; this marked the first time a performance requirement was included for gasket technology in the standard. Derived from industry fugitive emissions requirements, standard ASME B16.20 spiral wounds are designed to function as low-leak technology.

As industry regulations aim for a net-zero carbon footprint, technologies offering consistent emissions compliance will witness increased adoption among end users and may become mandatory as part of EPA consent decrees.

For more information, visit teadit.com or contact Angelica Pajkovic at angelicap@teadit.com. ●