The Tetra Pak facility in Pune, which was awarded Platinum Certification by IGBC

Mechanical Piping Systems
for Sustainable Infrastructure of Buildings

By Pankaj Soni
Country Manager, India
Victaulic, Pune

Introduction

Population growth and subsequent development has had a major impact on our natural environment and the effects of pollution have become more obvious than ever in recent decades, sparking a movement to promote energy efficiency and a real need to establish organizations that promote a green and sustainable future.

With the construction industry being one of the larger consumers of energy and resources, the manufacture, design, construction, and operation of buildings has never been more critical than it is today.

This article discusses sustainable building and the advantages of grooved mechanical piping systems, the role of industry standards for green buildings, and how alternative joining methods may contribute towards sustainable building rating schemes.

Sustainable Design

Sustainable design involves more than just site orientation and energy-saving construction techniques. What goes into a building in the way of infrastructure is equally important. Well-planned HVAC, plumbing and other mechanical engineering systems are key to making a building sustainable throughout its life cycle.

This philosophy needs to be taken into account from the point of manufacture – for instance, employing lean production processes to reduce waste and increase efficiency, manufacturing

About the Author

Pankaj Soni is Country Manger for India with Victaulic, the manufacturer of mechanical pipe joining systems, which is a founding member of the Indian Green Building Council (IGBC) and is involved with BREEAM and other international initiatives. He has worked in a variety of senior management roles for international engineering firms and has more than 20 years of professional industry experience. He holds a BE in Mechanical Engineering as well as an MBA.

continued on page 54

continued from page 52

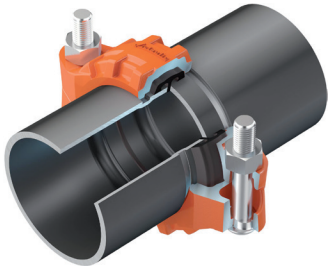
with recycled materials, dip coating to minimise Volatile Organic Compounds (VOCs), and reusing sand.

Grooved Mechanical Pipe Joining Technology

Grooved joining technology is rooted in sustainability, and even before the evolution towards green building it was providing a more efficient, cleaner and safer system compared with other pipe joining methods such as welding, soldering or brazing.

Grooved systems employ a roll grooving process to join pipes, valves and other components. Using a two-bolt coupling design, pipe fitters can make rugged, secure joints quickly and easily using basic hand tools. And with a union at every joint, contractors have field flexibility for on-site decision making. The couplings are sealed with a durable elastomeric gasket designed to withstand sustained high compressive and cyclical loads.

During installation, mechanical grooved piping systems significantly reduce or eliminate waste, emissions and noise pollution on the job site, providing a safe and healthy environment. By-products of welding fumes can contain lead oxide, carbon monoxide, VOCs and hydrochloric acid in addition to other harmful particles and gases. The elimination of these harmful pollutants means less airborne pollution providing for a more sustainable environment, and a safer job site during construction, maintenance or retrofit work.



Mechanical grooved piping systems significantly reduce or eliminate waste, emissions and noise pollution during installation

A grooved mechanical pipe joint does not require the use of electricity during installation, reducing the draw on power resources. Pipes that are joined by welding or soldering require the use of large amounts of electricity for prolonged periods of time, consuming up to 4kW on a 200mm (DN200) joint.

The installation of a grooved mechanical joint is cleaner than soldered joints, and reduces on-site job waste. Unlike soldering and brazing methods, grooved mechanical joints do not require flux to seal the joint, which must be flushed and cleaned from the system prior to operation. Additionally, soldered systems may require as much as 35 percent re-work for failures. Grooved mechanical pipe joints can be visually inspected for proper installation so re-work is minimal, saving energy, resources and time on the job, while being generally easier to align and rotate.

Prefabrication Advantages

Piping is an area where front-loading efficiencies and maximising productivity can produce significant savings in man-hours and ultimately help compress construction schedules and reduce environmental impact.

In fact, while piping system materials can account for as little as one per cent of total installed costs on a project, their installation time can eat nearly 30 per cent of the entire project schedule. Therefore, when considering the significant schedule and cost advantages, as well as optimized energy consumption achieved by strategic prefabrication, one can begin to see why prefabrication is indeed coming of age.

Fabrication shops provide a cleaner, more organised environment where tooling and efficient layouts allow pipe spools to be manoeuvred more safely and more quickly than on the job site, resulting in less material waste and optimized energy use. Accurate prefabrication also reduces the need to over-order product for site assembly leading to reduced lay down area and minimizing overall site impact.

Grooved prefabrication minimizes transportation costs and site impact

Grooved prefabrication minimizes transportation costs and site impact. Joined pipe can be prefabricated and configured to lay flat on a truck bed, unlike prefabricated welded spools. This means that two-thirds more material is transported per truckload as compared to welded pipe spools.

Benefits of Grooved Joining

Energy costs typically represent 30 per cent of a building's annual budget and are the single largest operating cost (Energy Star). The Energy Systems Lab at Texas A&M University has indicated that energy use in buildings could be reduced from 10 to 40 per cent by improving operational strategies in buildings, including maintenance strategies.

The grooved piping system is effective on a variety of piping systems, including the promotion of lighter wall pipe on a variety of applications. Lighter wall pipe can provide five to ten per cent more cross-sectional flows than welded pipe. Pipe couplings and fittings are designed to minimize friction, improve throughput and thus reduce power requirements at the pump.

Additionally, with soldered or brazed piping systems, accessing valves, strainers, pumps and water softeners is often a time-consuming and inconvenient process due to necessary system shutdown and drainage. In practice, the more difficult the process, the more likely the maintenance will be deferred. For access to a grooved piping system, a maintenance person has to simply loosen the two coupling bolts.

A lot of buildings also suffer from temperature variations that can lead to tenant complaints, high energy consumption and increased operating expenses. In most cases, these faults can be easily resolved by installing grooved balancing valves in the heating or cooling system in conformance with original design performance specifications.

continued on page 56

continued from page 54

Importance of Certification

In order to promote sustainability through the life of a building, there are various certification systems all over the world – often called Green or Sustainability Building Councils – with different responses tailored for different regions. These certification bodies and the criteria they use to classify a building's energy consumption and level of sustainability varies from region to region, but the goal remains the same.

BREEAM (Building Research Establishment Environmental Assessment Method) is important, in many regions, including the UK, Scandinavia, the Netherlands and Austria. It is an internationally recognized certification system that measures how well a building or community performs across 10 metrics; management, health and well-being, energy, transport, water, materials, waste, pollution, innovation, land use and ecology.

In Germany, a certification system developed by the Deutsche Gesellschaft fur Nachhaltiges Bauen (German Sustainability Building Council or GSBC) and the federal ministry of Transport, Building and Urban Affairs (BMVBS) is used. In France, HQE (Haute Qualité Environmentale – High Environmental Quality) is a French rating tool for identifying and implementing practical and measureable green building design, construction, operations and maintenance solutions.

LEED (Leadership in Energy and Environmental Design) is an internationally recognized certification system developed by the U.S. Green Building Council (USGBC), and a concise framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions.

There are Green Building Councils awarding LEED status in many countries including India. With LEED, buildings and communities are evaluated throughout the building lifecycle on essential metrics: energy savings, resource management, water efficiency, CO_2 emissions reduction, and improved indoor environmental quality. A single score is given on a scale of Certified, Silver, Gold and Platinum.

From Cambodia to Uruguay, and China to Brazil, grooved piping systems have been installed in numerous LEED rated buildings – including the LEED platinum rated Manitoba Hydra Building in Canada, the LEED platinum rated NHN Data Centre in Korea, and the LEED platinum rated Alberici Headquarters in the United States.

Grooved Joining in India

In India, grooved mechanical pipe joining systems can be found in gold-rated LEED construction projects, including Ingersoll Rand, where grooved systems delivered environmental benefits including reduced construction footprint and overall waste as a result of pre-fabrication, reduced electricity consumption during installation and maintenance activities through the elimination of weld installations.

Other gold-rated LEED installations include JW Marriott Pune and the Park Hotel Hyderabad. In addition, the new Tetra Pak facility in Chakan, Pune, was awarded Platinum certification by the

The LEED Platinum rated Alberici Headquarters in the United States uses grooved mechanical pipe joining

Installing a mechanical grooved piping system in London's Hackney Borough Council Customer Service Center reduced the total system weight and enhanced on site material handling

continued on page 58

continued from page 56

Indian Green Building Council (IGBC) in 2014. This is the equivalent to LEED certification.

The Park Hotel Hyderabad - a Case Study

The Park Hotel Hyderabad is a certified green building and has achieved LEED Gold certification. The project's contractor, Sterling and Wilson, and engineer, Spectral, chose to install grooved mechanical products in the utility system because of several advantages over welding.

The Advanced Groove System (AGS) provided a safe and productive way to join large diameter pipes (from 14" to 16"/350 – 406 mm). The two-piece housing of the couplings enables pipe joining by tightening 2 bolts, depending on size, thereby avoiding hot works on site.

Due to the ease of installation and the visual confirmation of proper joint assembly, Spectral and Sterling and Wilson were able to meet the tight project deadline. AGS simplified total system installation and assembly speed, allowing the owner to finish the project on schedule.

Contribution to Green Rating

Grooved Mechanical systems can contribute to ratings success with agencies in a variety of ways. Here are a few of them.

Management of Waste and Content Recycling

Because grooved mechanical pipe joining systems can be produced utilizing recycled materials, and the sand for the casting process can be recycled, less construction and demolition debris is disposed of in landfill and incineration facilities, more resources are recovered, re-cycled and returned to the manufacturing process, and more materials are reused on job sites. Site waste can also be minimized through lean manufacturing by producing and shipping only required materials, as well as coordinated deliveries according to the contractor strategy and schedule.

Indoor Air Quality During Construction

Unlike welding, which emits highly toxic pollutants, uses vast amounts of electrical energy and specialty gases, mechanical grooved pipe joining systems feature flameless connections and avoid impact on human safety and the environment.

Lowering Emissions

Grooved mechanical fittings and couplings can be dip coated, a process that creates less wasted paint, does not pose hazardous air pollutant (HAP) risks nor contains as many volatile organic compounds (VOCs) as spray processes.

Comfort for Occupants

Use of a grooved mechanical balancing valve system can enhance overall project ventilation and air distribution flow. Balancing valves maintain a dynamic flow that enables the HVAC system to provide correct energy output at all times, thus promoting comfort for occupants.

Continuous Innovation

Manufacturers of grooved pipe joining systems are continuously looking for new opportunities to meet customer demands for innovative, superior green products, such as faster installing environmentally friendly installation-ready couplings, which join pipe without the need to disassemble bolts, nuts and housings. For instance, the QuickVic™ Installation-Ready™ design already reduces handling and speeds installation, can be installed by hand and can result in less energy consumption.

Conclusion

It is vital that sustainable solutions are considered at every stage in the construction process – from research and development, product manufacturing, system installation and efficient operation through the entire life of a building. Environmental conscience practices and products positively impact people, the planet and the bottom line of businesses.

Mechanical pipe joining is a highly effective and reliable alternative to traditional pipe joining methods that can deliver sustainability advantages at every stage throughout the life of a building.

Today's engineering and construction professionals are increasingly focused on constructing buildings that are environmentally sustainable, flexible, and energy efficient. The demand for building materials, products and design solutions that factor into creating a sustainable environment has risen dramatically and adopting a tried and trusted alternative pipe joining method can be a sound way of contributing to sustainability goals. ❄