

# **Coal Tar Pitch – Its Past, Present and Future in Commercial Roofing**

*By Joe Mellott*

Coal tar remains a desired and strong source of technology within the roofing industry, as innovative coal tar products significantly reduce associated health hazards and environmental impact. To help you better understand the role that coal tar continues to play in the commercial roofing market, this article will explore:

- The history of coal tar
- Its associated hazards
- Hot and cold coal tar adhesive technologies
- Modified coal tar pitch membrane technologies
- Coal tar's sustainability attributes

## **A Brief History of Coal Tar**

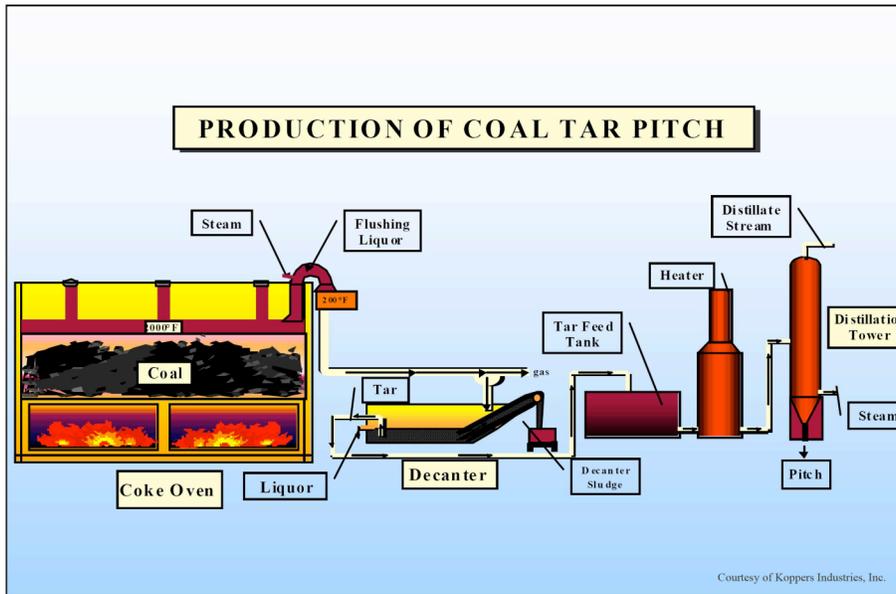
In order to understand what coal tar pitch is, it's important to understand its origins and refinement methods. Coal tar can be refined from a number of sources including coal, wood, peat, petroleum, and other organic materials. The tar is removed by burning or heating the base substance and selectively distilling fractions of the burned chemical.

Distillation involves heating the substance to a point where different fractions of the substance become volatile. The fractions are then collected by condensing the fraction at a specific temperature.

A base substance can be split into any number of fractions through distillation. A good example of industrial distillation is the oil refining process. Through distillation, crude oil can be separated into fractions that include gasoline, jet fuel, motor oil bases, and other specialty chemicals. Fractionation or distillation is a tried-and-true method for breaking a substance into different parts of its composition.

One of the first uses of coal tar was in the maritime industry. Trees stumps were burned and the tar fractions were collected through distillation of the tar. The tar was then used to coat wood boats. Tar was an excellent waterproofing agent and it also helped to protect the wood from insects.

The tar used in roofing is a derivative of the fractional distillation of coal gas, which is sometimes referred to as coke. Many other chemicals are produced in this and subsequent fractioning processes, including naphtha, creosote, benzene, toluene, and phenol.



Coal tar pitch consists of a collection of cyclical hydrocarbons of various molecular weights and configurations. Every coal tar pitch can be refined to a greater or lesser degree; greater refinement yields a stiff, glassy product, while reduced refinement yields a highly viscous fluid.

Coal tar and coal tar derivatives are used in a variety of industrial applications. Tar pitch from wood is used in soap, food, and medical applications, while coal tar derivatives can be found in dyes and cosmetics. One of the predominant uses for coal tar derivatives is construction material. Coal tar pitch has been used as the base media for coatings and adhesives for many years, including roofing bitumen.

Built-up commercial coal tar pitch roofing has historically provided long lasting and sustainable protection for the building envelope. The inherent waterproof nature of coal tar pitch provides a tight waterproof roof construction. The self-healing properties of coal tar pitch tend to bridge small deformities created by debris, stress movement, hail, and other surface punctures.

Further, coal tar pitch is highly chemically resistant, resisting exposure to a large variety of acids, bases, and solvents. These properties have led to some of the most sustainable roof systems available in the market place. It is not unusual to observe coal tar pitch roofs that last up to 40 years.

## The Hazards of Coal Tar Pitch

While coal tar pitch enjoyed a significant percentage of the roofing market for more than 50 years, its share has shrunk greatly during the last 20 years. This reduction has been fueled by the confirmation of potential carcinogenicity in coal tar pitch volatiles or fumes. Specifically, scientific investigations by the National Institute for Occupational Safety and Health have established that, when heated, coal tar pitch yields polycyclic aromatic hydrocarbons. A substantive portion of these are suspected or known carcinogens.

In an effort to reduce these emissions at the coal and coke facilities where the coal tar originates, efforts were subsequently made to remove as much of the potential carcinogen as possible at the time of processing. This resulted in an overall reduction of the coal tar pitch available to the marketplace, and therefore an increased base cost for coal tar pitch.

This combination of factors has changed the face of the coal tar pitch commercial roofing market in North America. In an effort to minimize potential adverse effects while maintaining the extraordinary waterproofing performance of coal tar pitch, some roofing material manufacturers have invested considerable research and development time into next-generation coal tar pitch roofing solutions.

## **Hot and Cold Coal Tar Pitch Adhesives**

Today, coal tar pitch roofing adhesives can be installed hot or cold, while maintaining the same level of waterproofing protection and chemical resistance as traditional coal tar pitch roof systems. In addition, recent manufacturing advancements take the base technology another step forward.

By incorporating a blend of specialized polymers with the coal tar, polymer-modified coal tar achieves low-temperature performance that surpasses that of traditional coal tar products. Tests show that modified coal tar pitch can achieve flexibility numbers as low as 30 degrees Fahrenheit. As an added benefit, the polymer additive greatly improves the elongation of the coal tar pitch base; products are currently available with elongations of greater than 2,000 percent. Further, these new compounds have dramatically improved impact resistance. In essence, recent technology results in the first truly elastomeric coal tar pitch.

Most promising of all, these new compounds improve the environmental nature of the coal tar pitch. Through the polymer blending process and the preconditioning of the coal tar pitch, many of the volatile emissions are reduced or eliminated. Independent testing by the Environmental Protection Agency methods indicates a minimum reduction of 50 percent of the volatile emissions, in comparison with traditional coal tar pitch. Significantly, a good portion of these reductions take place within the most hazardous compounds present in standard coal tar pitch.

## **Coal Tar Pitch Membranes**

Through continued research, modified coal tar pitch technology has taken one step further and combined the novel polymer-modified coal tar compound with a fiberglass/polyester scrim to create the first reinforced modified coal tar roofing membrane. Currently, there is only one such membrane available in the marketplace.

This advanced, polymer-modified coal tar membrane technology offers the traditional chemical resistance of coal tar pitch, with the improved flexibility of polymer-modified coal tar pitch. In addition to excellent low-temperature flexibility, these membranes offer added fatigue resistance. Due to their reinforcement with a high tensile-strength fiberglass/polyester composite scrim, these waterproofing membranes are engineered to easily overcome the rigors of roof exposure.

## **Sustainability**

As today's building practices are driven by a market focused on sustainable design, manufacturers are advancing new product technologies that balance proven performance with environmental stewardship. Building maintenance and design professionals have become more and more focused on innovations that incorporate post-industrial and/or post-consumer content as a way to identify "green" products in the marketplace. The goal of incorporating post-industrial and post-consumer content into products is to reduce the dependence on extracted raw materials and to divert materials once bound for the landfill.

Although traditional coal tar products are not considered to be in the forefront of "green" design, the market's new-found focus on sustainable building practices casts coal tar's humble origins in a new light. When examined from a purely sustainable perspective, coal tar roofing products exemplify the process of diverting an industrial waste stream into a viable high performance building product.

By utilizing an industrial byproduct of the coking process as a basis for roofing products, coal tar roofing systems can contain upwards of 90 percent post-industrial content. This innovative approach to utilizing high amounts of post-industrial content greatly reduces the reliance on virgin raw materials contained in a building, and can contribute to a building owner's goal of achieving USGBC LEED®[1] registration.

## **Conclusion**

Field proven. Long lasting. Flexible. Sustainable. These are the attributes you can expect from today's coal tar roofing systems. When combined with the significant strides that have been made in reducing the potential health hazards and environmental impact of coal tar products, the latest advancements in coal tar roofing technologies are making coal tar as viable for the future of commercial roofing as it has been for its past.

<p>Joe Mellott is director of technology for The Garland Company, Inc., a Cleveland, Ohio based manufacturer of high-performance roofing solutions for the commercial building envelope. He holds several patents for roof-related innovations and received the 2006 Industry Statesman Award from the Roof Coatings Manufacturers Association (RCMA) for his work in advancing roof coatings industry technology. A frequent contributor of technical articles to industrial publications, and a participant in innumerable roofing-related organizations, Mellott has served as the technical chair, and vice president of the Roof Coatings Manufacturers Association (RCMA); on the board of the Cool Roofs Rating Council (CRRC); and as a member of the Roof Consultant Institute (RCI), the National Roof Contractors Association (NRCA), and the Asphalt Roofing Manufacturers Association (ARMA)</p>
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