High Temperature Filtration Media in Incineration

James W. Griffin, Product Manager, Tetratec

Incineration develops a different image for different people. To some, incineration is the brning of unwanted or waste materials from their manufacturing process (Industrial). To others, incineration is the burning of hospital waste (Medical) and to others incineration means burning of garbage from out homes. This type of incinerator is called a Municipal Solid Waste Incinerator (MSW). Some incinerators burn only tires. All incinerators were developed as an alternative to a burial of waste in the ground. In the early days, incinerators burned everything from refrigerators, tires, liquids, and household garbage in the same furnace. Of course, the process produced air pollution and soil pollution (eventually the ash from incinerators must be landfilled). Fueling these incinerators could be liquid wast, solid waste, or RDF. RDF is Refuse Derived Fuel produced by chopping waste into relatively uniform size material for feeding the boiler. Wear and Tear on equipment and the generation of all kinds of air pollutants have resulted in the segregation of waste. In the United States, tires and refrigerators are no longer burned with household of industrial waste. This segregation of waste allows for strategies aimed at specific pollutants.

Baghouses on incinerators generally operate at higher temperatures and must survive harsh chemical enviornments. For this reason *Teflon® or Tefaire® have long been the filter media of choice. Today, with improved operation of incinerators and waste segregation, woven fiberglass with an expanded PTFE membrane, and in a couple of cases Ryton®, have proven to work very well. In medical waste, incinerators P-84™ with and without expanded PTFE membrane have worked well. Around the world, solid particulate emissions are not the greatest pollution control challenge. The greatest challenge is to control chemical pollutants, such as SOx, NOx, HCL, and Dioxin.

In the United Sates there is a focus on SOx, HCL and NOx control. MSW's are for the most part large units up to 600-800 megawatt. Bafhouses tend to be large reversed air or shake units with 340-475 g/m^2 woven fiberglass filters. Smaller pulse jet units use a 750 g/m^2 woven fiberglass with and without membrane filters. The spray dryer or dry injection system prior to the baghouse reduces the harsh chemical enviornment. This causes 3-5 years of filter life to be achieved while reducing Sox by 80-85% and reducing HCL by 95%.

In France, there are at least 8 pulse jet baghouses on incinerators using 450 g/m^2 woven fiberglass with an expanded PTFE membrane. All units are achieving 3-4 years of filter life. One incinerator in the Bordeaux wine region of Southwest France has approximately 1000 filters 130 mm by 3.5 meters long that are now into their 5th year of operation. The incinerator is fueled by both liquid and solid waste from the wine region. At start up, the pressure drop across the 450 g/m^2 woven fiberglass filters was 100 mm H_2O and with well over 4 years of service the pressure drop across the

filters has only risen to 120 mm H_2O. Pulse cleaning is performed off line. A 750 g/m^2 woven fiberglass with an expanded PTFE membrane is used in enviornments where abrasion is a problem.

Taiwan has contracted with two major equipment suppliers to build nine incinerators. Six units are under various phases of construction. Currently, all nine pulse jet units are slated for Teflon® or Tefaire® filters. The Asia community has a preference for Teflon® or Tefaire® filters.

In Korea, most of the incinerators utilize pulse jet baghouses. One industrial incinerator in Gu Mi is reverse air. About 45% of the baghouse filters are either Teflon® or Tefaire®. Most of the units were placed into service with conventional woven fiberglass filters, but experienced short bag life. About 25% of the units have switched to expanded PTFE membrane on 450 g/m^2 woven fiberglass and about 35% are using Teflon® or Tefaire®. The largest unit utilizing expanded PTFE membrane on woven fiberglass filters is a MSW incinerator in Busan, Korea. It has a pulse jet baghouse cleaned off line with 1720 filters. This is a new unit expected to start up in the fall of 1997.

Japan has been called the land of incinerators. There are over 1850 incinerators on record. The first incinerator to utilize a baghouse was built in 1985 by Mitsubishi Heavy Industry Co. Nearly all of the incinerators are owned by municipal offices and some 75-80% operate from 8-16 hours a day. Of the 1850 plus incinerators, about 75-80% use electrostatic precipitator to control pollutants. All of the incinerators built since 1995 have utilized a pulse jet baghouse (best available technology) for pollution control. Currently only about 10-15% of the incinerators have a baghouse and most of these were built in the last 3 years. About 60-65% of the units use Tefaire® or Teflon®, about 25% use woven fiberglass with and without expanded PTFE membrane, and about 10% of the units use other filter media.

Most filter media is efficient enough to meet the requirements of 5 mg/nm^3 and with spray dryer or dry injection SOx and HCL is not a problem. In Japan, the focus is on Dioxin. The Ministry of Health and Welfare announced new guidelines for Dioxin. The old level of 1ng/nm^3 was reduced to 0.1ng/nm^3 for new incinerators operating 24 hours per day. Existing incinerators, built before 1997, operating 24 hours per day will remain 1 ng/nm^3. To achieve these directives, process changes will have to be made. For instance, lowering the temperature of the baghouse from 200-230°C to 160-180°C, a smaller dust cake on the bags, activated carbon injection or a baghouse behind the current baghouse containing activated carbon. All of the above could be enhanced with an expanded PTFE membrane. Furukowa Co. (OEM) has been utilizing expanded PTFE on woven fiberglass filter media for small batch type incinerators since 1991. Recently, ABB (OEM) has begun to use expanded PTFE membrane on woven fiberglass filters for small plants. Takuma, a large plant manufacturer, has decided to use expanded PTFE membrane filters in three middle seal semi-continuous type incinerators. The plants will be located

in Hokaldo, Shikoku, and Kyushu, Japan.

In Japan, the total volume of municipal waste is about 50 million tons per year with about 73% being handled by incineration. Incineration reduces the volume by 90% but this still requires 3.65 million tons of waste to be landfilled just from incineration. Further reduction of volume is needed. New incinerator plants are being equipped with ash melting furnaces. These ash melting furnaces produce very fine particulate which require membrane filters.

Conclusion:
Woven fiberglass with expanded PTFE membrane has operated successfully in nearly all segments of the world incinerator market. The fiberglass filters are achieving approximately the same life as Teflon® bags while costing about 35-40% less. With the severe cost reduction currently taking place in the incinerator market, this will be a significant issue.

With the little to no dust cake on a surface filter such as expanded PTFE membranes, the production of Dioxin may be reduced. Additional throughput resulting from membrane filters would allow for outside air to be pulled into a baghouse reducing the temperature; i.e., help reduce Dioxin. The high efficiency of a membrane filter would allow for an activated carbon filter to be put behind the baghouse.

Ideally, an incinerator would burn the used filter at the end of their useful service life. Generating flourine precludes burning Teflon® filters. Due to the small amount of Teflon® in a woven fiberglass with membrane filter bag, they may be incinerated in some markets.

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