



Pennsylvania Manufacturers' Association

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Joint Hearing:
House Health Committee &
House Environmental Resources and Energy Committee

Oil and Gas Byproducts: Powering Modern Medicine and our Healthcare System

Carl A. Marrara
Executive Director

Good morning, Chairwoman Rapp, Chairman Frankel, Chairman Metcalfe, Chairman Vitali, and all esteemed members of the House Health and House Environmental Resources and Energy Committee. I am Carl A. Marrara, Executive Director of the Pennsylvania Manufacturers' Association. Thank you for the opportunity to present to you today on the topic of: "oil and gas byproducts: powering modern medicine and our healthcare system."

Founded in 1909 by Bucks County industrialist Joseph R. Grundy, the Pennsylvania Manufacturers' Association is the nonprofit, statewide trade organization representing the manufacturing sector, it's 540,000 employees on the plant floor, millions of additional jobs in supporting industries, and more than \$92.3 billion in gross state product in Pennsylvania's public policy process.

Should you find yourself in a medical center, take notice of the materials around you. Perhaps it would be easier to pinpoint what does not have a foundational root in petrochemicals as opposed to those that do. Every piece of tubing, connected to a machine full of specialty metals, coatings, batteries, plugged into a wall with an antimicrobial coating, supported by walls constructed with resins, the wiring inside coated by plastics, the machine plugged into the wall for electricity likely generated by natural gas. The scrubs the medical staff are wearing contain synthetic fibers derived from petrochemicals, the medical masks, the face shields, the latex, vinyl, or nitrile gloves that protect our health care workers all have their foundational footprint in petrochemicals. The packages and containers that keep sterile all the tools, dressings, and medications all share this in common, as well.

Vaclav Smil, a professor emeritus at the University of Manitoba penned a piece for Time Magazine in March of 2022 where he made similar observations – he wrote:

“But plastics are now most indispensable in health care in general and in hospitals in particular. Life now begins (in maternity wards) and ends (in intensive care units) surrounded by plastic items made above all from different kinds of PVC: flexible tubes (for feeding patients, delivering oxygen, and monitoring blood pressure), catheters, intravenous containers, blood bags, sterile packaging, trays and basins, bedpans and bed rails, thermal blankets.”¹

Let us first understand the relationship between oil, natural gas, and plastics. According to the United States Energy Information Administration, “Although crude oil is a source of raw material (feedstock) for making plastics, it is not the major source of feedstock for plastics production in the United States. Plastics are produced from natural gas, feedstocks derived from natural gas processing...”²

To further understand this relationship, Penn State's Daniel Brockett published an article that explains the chemistry:

¹ Vaclav, Smil. The Modern World Can't Exist Without These Four Ingredients. 2022. <https://time.com/6175734/reliance-on-fossil-fuels/>

² Energy Information Agency. 2022. <https://www.eia.gov/tools/faqs/faq.php?id=34&t=6>

“Natural Gas Liquids (NGLs) include ethane, propane, butane, isobutene, and pentane. They also include a small amount of heavier hydrocarbons, such as hexane, heptane, and octane. Ethane is a major component of NGLs, especially in the Marcellus, Utica and Eagle Ford formations. While all of these NGLs can be cracked and used to produce petrochemicals, ethane is often the least expensive to use to create ethylene in places like the Appalachian Basin and the Gulf Coast... The ethylene formed in the cracking process is next transported by pipeline to another facility to be converted to usable products, the most common of which is polyethylene. Ethylene is at this point still a gas and needs pressure and a catalyst to turn it into polyethylene, a resin... Polyethylene resin can be transported by truck, barge, or train to a manufacturing facility to make end products.”³

It is evident that plastics, rooted in petrochemicals, have a major role in health care which will be explored in more depth later in this testimony. But we also have manufacturers in Pennsylvania that specialize in the component parts for major medical devices; the types of devices that have redefined modern medicine allowing surgeons to perform minimally invasive surgeries in almost all parts of the body resulting in better outcomes and shorter recovery periods. But people design, engineer, and install these state-of-the-art machines for highly specialized doctors to use; and nearly every component part is made from or using petrochemicals. Grinding metals down to the .5 micron threshold, which companies here in Pennsylvania do for highly specialized surgical devices, requires many solvents and processes that are all derived from petrochemicals. The antimicrobial coatings on these metals and machines used in the process are also derived from petrochemicals.

But just how many manufacturers rely on these feedstocks and manufacturer products that have end use in the health care and life sciences industry is difficult to quantify. What we do understand is that petrochemicals, derived from natural gas and fossil fuels, are critical to nearly every component part of the manufacturing of products in this field.

Grand View Research published a 2021 study in which the stated, “The medical plastics market in the U.S. was valued at USD \$13.17 billion in 2021. The growing elderly population and growing demand for at-home healthcare are expected to drive the market...”⁴ Globally the market accounted for \$46.1 billion in 2021.⁵ Within this market:

“The medical components segment dominated the application segment for the global market and accounted for the largest revenue share of more than 40.0% in 2021. The growing application scope of polypropylene in the manufacturing of diagnostic devices, trays, pans, containers, syringes, implant trials, and medical cover sheets is expected to drive the demand. Polypropylene is expected to witness substantial growth in medical components application owing to its low weight, high bacterial and chemical resistance.”⁶

³ Brockett, Daniel. How Plastic is Made From Natural Gas. 2017. <https://extension.psu.edu/how-plastic-is-made-from-natural-gas>

⁴ Grand View Research. 2022. <https://www.grandviewresearch.com/industry-analysis/medical-plastics-market>

⁵ Ibid.

⁶ Ibid.

Polypropylene manufacturing is classified in the industrial code “plastics material and resin manufacturing.” Currently, there are 2,811 jobs on the plant floor supporting this industry in our commonwealth at an average salary of \$124,555 per year. This industry has an overall economic output of \$4.1 billion per year. But this is just the beginning of the economic impact and jobs associated with these industries as so much derived from these products is what is vital to the health care industry.

Specific to medical device and pharmaceutical manufacturing, below is a table of manufacturing categories, the number of Pennsylvanians these firms employ, the average annual compensation for these employees, and the output these firms have on the greater economy.⁷

Industry type	# of employees	Average salary	Economic output
Electromedical and electrotherapeutic apparatus manufacturing	3,744.17	\$100,015.64	\$1,765,488,190.23
Surgical and medical instrument manufacturing	9,012.96	\$116,147.42	\$3,045,788,846.75
Pharmaceutical preparation manufacturing	11,707.68	\$203,089.06	\$18,930,949,736.55

There are many other industries in Pennsylvania that rely on petrochemicals that support health care. These are included in the table below,⁸ but again, it remains unclear what percentage of these products find their end use in the medical field, but what we do know is that these products are essential to modern standards of care.

Industry type	# of employees	Average salary	Economic output
Plastics packaging materials and unlaminated film and sheet manufacturing	5,422.41	\$77,877.60	\$2,561,946,269.08
Rubber and plastics hoses and belting manufacturing	604.37	\$67,137.32	\$175,396,288.17
Unlaminated plastics profile shape manufacturing	1,630.45	\$73,164.36	\$786,685,111.20
Laminated plastics plate, sheet (except packaging), and shape manufacturing	2,188.09	\$78,367.34	\$846,908,413.51
Paint and coating manufacturing	1,583.92	\$101,183.67	\$1,308,183,349.97
Adhesive manufacturing	770.62	\$94,599.75	\$513,782,954.84
Other plastics product manufacturing	18,806.17	\$64,493.37	\$5,517,518,343.26

⁷ IMPLAN, 2022.

⁸ Ibid.

Given Pennsylvania's access to world historic reserves of natural gas, and the fact that an economy-changing ethane cracker is about to come online in the coming months, Pennsylvania is poised to lead the United States in this sector of manufacturing. Proximity to feedstocks is a prime driver of economic development according to a study by the National Association of Manufacturers and IHS Economics.⁹ We should expect these numbers listed above grow as new industries and increased access to feedstock is brought online.

As an indicator of just how critical these inputs are, approximately 3% of petroleum production is used for pharmaceutical manufacturing, but nearly 99% of pharmaceutical feedstocks and reagents are derived from petrochemicals.¹⁰ Dr. Easter's study continued, "No literature directly addresses the possibilities for plastic substitution, but such options appear to be rare."¹¹

This fact is solidified in a 2011 American Journal of Public Health by Dr. Jeremy Hess when his study stated, "Petroleum is used widely in health care—primarily as a transport fuel and feedstock for pharmaceuticals, plastics, and medical supplies—and few substitutes for it are available."¹² He continued, "Health care constitutes 16% of the US gross domestic product... Given that the United States consumes roughly one quarter of the world's oil production... it is safe to conclude that health care in the United States consumes a large amount of petroleum and that health care's exposure to petroleum supply shortages is likely significant."¹³

In a study published in 2013 by the journal, Reviews of Environmental Health, Arizona State researchers Emily North and Rolf Halden stated:

"The benefits of plastics are particularly apparent in medicine and public health. Plastics are versatile, cost-effective, require less energy to produce than alternative materials – such as metal or glass – and can be manufactured to have many different properties. Due to these characteristics, polymers are used in diverse health applications, such as disposable syringes and intravenous bags, sterile packaging for medical instruments as well as in joint replacements, tissue engineering, etc. In medicine alone, the diversity of plastics' uses is incredible. Prosthetics, engineered tissues, and microneedle patches for drug delivery are all possible with polymers... Syringes are a good example of how plastics have benefited public health through single-use applications and later, through reusable products. Healthcare workers have long cited convenience for choosing disposable products. Disposable plastic items such as latex gloves, intravenous (IV) bags and dialysis tubes are inexpensive and allow for patient safety as well as time savings, due to eliminating the need to sterilize used equipment. Disposable syringes in particular were in focus during the early 1980s as a way to reduce the

⁹ National Association of Manufacturers, IHS Economics. Economic Benefits of Natural Gas Pipeline. 2016 nam.org/wp-content/uploads/2019/05/NAM_NG_Report_042816.pdf

¹⁰ Hess, Jeremy; et al. Petroleum and Health Care. March 25, 2011. <https://ajph.aphapublications.org/doi/full/10.2105/AJPH.2011.300233>

¹¹ Ibid.

¹² Ibid.

¹³ Ibid.

risk of transmitting blood-borne infections such as human immunodeficiency virus (HIV) and hepatitis B through injections from used needles.”¹⁴

The authors of this study do warn of the negative impact plastics can have on the environment through the medical waste that is created. More than half of a hospital’s medical waste is created from use in surgical suites, where most of the disposable items are made of polymers. Nearly 20 percent of hospital medical waste comes from IV bags and tubing used to administer them. But manufacturers have, in just the very recent past, been leading the charge on how to create plastic feedstocks using plastic waste.

Just two years ago, Governor Wolf signed Representative Ryan Mackenzie’s (R-Lehigh) House Bill 1808, aimed to support advanced recycling of plastic scrap. The legislation seeks to ensure postuse plastics are not misclassified as solid waste and can be used in innovative and environmentally beneficial processes to create a circular plastics economy. Nationally, there are already 16 operational or proposed facilities that deploy this advanced recycling process. The result is an environmentally beneficial feedstock while removing hundreds of tons of plastic out of our waste streams. Furthermore, modern technological advancements in this industry also aids in securing our supply chains.

And if there’s one thing we learned throughout the pandemic besides just how important medical devices, PPE, and pharmaceuticals are, is how fragile our supply chains are. Disruptions from foreign sources, and even domestic sources as “essential” versus “non-essential” industries were determined by bureaucratic offices made us realize how critical the complex web is that our manufacturers and the industries that rely on those products are. Therefore, the more we can secure these supply chains and distribution networks, using domestic feedstocks, the better. This is especially true as we continue to witness the market responding to consumer demands to further develop a circular plastics industry and expanded petrochemical processing to support industries such as health care.

The benefits of chemistry and petrochemicals are so all-encompassing that they are almost invisible, especially in the health care setting, which is why it has become possible for us to take them for granted. Thank you for hosting this hearing today to allow us to share the role Pennsylvania’s manufacturers are playing in the health of our commonwealth, nation, and world. It’s clear that there is still much to learn, but it’s also clear that modern health care could not sustain without oil and gas byproducts, petrochemical feedstocks, and the many products our manufacturers produce using these inputs.

¹⁴ Ibid.