By Randy Bruns

Get the Lead Out!

Get the lead out! A popular phrase in the military (usually followed by a reference to your posterior) and also heard in the early 1970s referring to unleaded gasoline when catalytic converters were first installed on cars.

How many times as kids did we hear the dangers of eating leaded paint? And now with the heightened concerns of foreign-made toys containing lead-based paint, the focus on lead continues.

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The Colorado Oil and Gas Association (COGA) recently received a notice from the Weld County (Wattenberg Field) Health Department regarding seven cases of elevated blood lead levels (six children, one adult), which it tracked to contamination of oilfield workers' clothes with lead-based pipe dope. Elevated lead levels were found in the workers' washers and dryers (lint traps), as well as in their vehicles. From there, it was spread to family members. This was only through skin contact from wearing the clothes. This does not take into account eating or smoking with contaminated hands at the rig site.

Types & History of Leaded Compounds

Two types of leaded compounds are in use today: API Modified for use on tubing and casing, and a 60% lead drilling compound. In the past, products were also made with red and yellow lead oxides. Lead oxide is considered a greater occupational health issue than metallic lead since it is more readily bioabsorbed. Their performance was not as suitable and was largely replaced in the early 1980s. Metallic lead was not considered as hazardous as lead compounds due to relative insolubility but can react in the environment or with cleaning products to form the more soluble, toxic forms.

According to Don Oldiges, vice president of research and development at Jet-Lube Inc., in 1947, API commissioned the Mellon Institute to develop a more consistent product for tubing and casing connections with better sealing and galling resistance properties. By 1951, a product was developed and ready for field test.

In 1953, API issued API Bulletin 5A2, which provided raw material specifications for purity and particle size distribution and finished product component percentage range requirement. The compound was designated as API Silicone, which was made with expensive, specialty silicone oil to address leak and galling issues. A revision of API Bulletin 5A2 was issued in 1956, including a modified version of the thread compound without the silicone due to complaints about the cost and availability. Both thread compounds contained the same range of lead, zinc, graphite and copper.

In response to many pipe yards having EPA issues with lead in the soil in the late 1980s and early 1990s, API issued in 1993 its Strategies for Today's Environmental Partnership (STEP) policy. API actively pursued generating bulletins, recommended practices and specifications to separate API from potential liability of requiring the use of leaded and other heavy metal-based products. Funding was provided that made API Bulletin 5A2 obsolete by implementing API RP 5A3, which did not specify a compound composition but provided a basis from which to compare thread compound performance. API Modified, which became the industry standard compound since 1956, contains 29% to 31% metallic lead, 17% to 19% graphite, 11% to 12% zinc and 3% copper. It is used for thread seal connections on tubing and casing, such as 8-round, buttress and particularly on premium/ proprietary connections (metal-to-metal seal).

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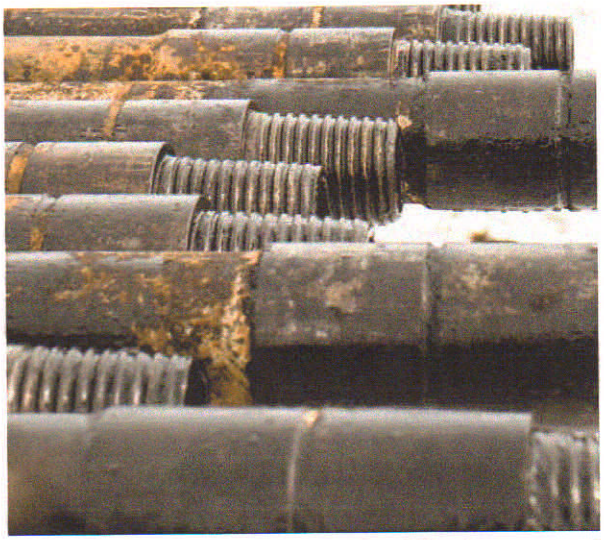

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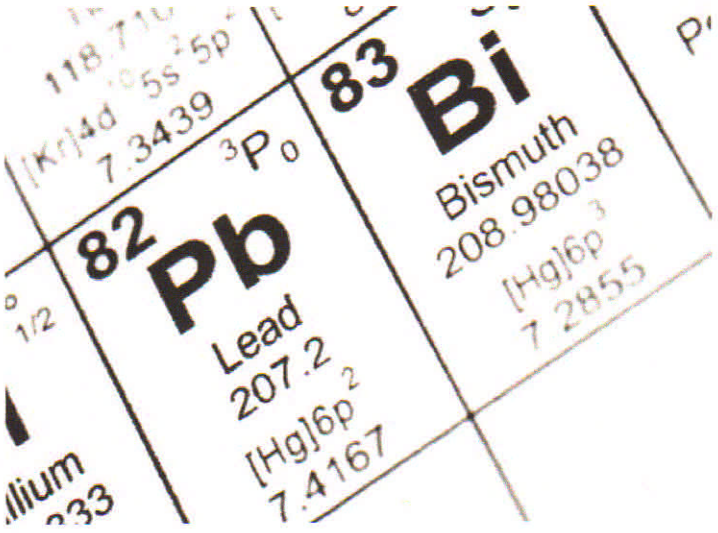

drill rods. Compounds like this have been used since the 1920s in various compositions and for years were recommended in API bulletins and recommended practices, such as API Bulletin 7A1 and API RP7G.

Leaded compounds work well for lighter-duty applications but do not work as well in today's more severe service. The problem lies with the fact that wells are drilled deeper, faster and hotter than ever before.

Metallic lead is an anti-seize and sealing agent that performs well because it is malleable and will plate onto metal surfaces. This can act to repair light galling in the thread form and to block the leak path in threaded connections. Leaded compounds work well for lighter-duty applications but do not work as well in today's more severe service. The problem lies with the fact that wells are drilled deeper, faster and hotter than ever before. Lead can actually start to become unstable with the grease base at temperatures greater than 180° F. At temperatures as low as 300° F, the lead can result in downhole makeup when torque forces of the hole are at half the initial makeup torque. Both types of leaded thread compound (drilling and production) have more environmentally friendly alternatives that are adequate or superior in performance standards.

Environmental Risks

What kind of environmental remediation risks are associated with using lead and zinc compounds? In drilling applications, for argument's sake, let's say that one 50-lb pail of a 60% leaded compound and five 50-lb pails of a 50% zinc compound are used to complete one well. You basically have more than 150 lb of lead and zinc that have been introduced into the well bore and mud system. Not to mention that you have "empty" pails to dispose of. This does not even take into account where the pipe is cleaned and reconditioned. If an inspection company or pipe yard is steam-cleaning or pressure-washing the threads and letting the residue fall to the ground, there is risk of soil and water runoff contamination.

Offshore Segment Standards Established

In the North Sea there is a multinational agency called OSPAR, which according to its website, is the mechanism by which 15 governments of the western coasts and catchments of Europe cooperate to protect the marine environment of the northeast Atlantic. The 15 governments are Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and U.K.

These countries established standards to minimize offshore pollutants. To be compliant with current requirements, thread compounds must not contain lead or other metals, no persistent polymers and must biodegrade 20% or more within 28 days. This makes manufacture of high-performance thread compounds a significant challenge but has resulted in excellent products.

The Future

Is this possibly the way the U.S. will be heading? Biodegradable products are the extreme case scenario, but metal-free products with "traditional" grease are still available. In relation to cost comparisons, a misperception exists that leaded compounds are actually cheaper than copper or metal-free compounds. This is usually not the case.

For example, if you were to buy a 50-lb bucket of a 60% leaded product versus a 50-lb bucket of metal-free compound, the leaded product will be cheaper. The devil in the details is that the leaded thread compound will be much more dense, therefore, you will have roughly 2.5 gallons of the leaded product versus 5 gallons of the metal-free product. This will result in less joints being doped and your yield not being as economical as a metal-free compound. Hmm. . . cheaper and better for our health and the environment. Sounds like the proverbial win-win. ✪

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This article appeared in the September/October 2010 issue of Well Servicing magazine and is printed with permission from the Association of Energy Service Companies (AESC) and contributing author Randy Bruns.

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