

Dopefree technology is a practice that can substantially address environmental issues in drilling and completion operations.

Executive Summary

In the make-up of pipe in the oilfield, a lubricating, sealing and thread protecting compound called pipe dope is generally applied to the threads of pipes. This pipe dope protects the connection threads, where the casing is the most susceptible to leaks, from galling, oxidization, and other frictional wear to ensure a good, secure connection throughout the life of the well and thwarting expensive repairs. Unfortunately, the use of leaded compounds may create health, safety, and environmental issues.

The most commonly used thread compounds are variations of dope established by the American Petroleum Institute, which are 30% lead by mass. Some dopes are even as much as 60% lead. Lead contamination to people and the environment may cause significant disruption to local plant and wildlife, and lasting health problems in children and adults; therefore it is important to limit lead discharges. Though current regulations dictate the disposal of unused pipe dope and dope on thread protectors, leaded thread compounds may find ways to improperly discharge throughout the life cycle of pipe and pipe dope, and a large amount of water is used to clean pipes and protectors at the rig site due to the presence of pipe dope. Due to an excess application, pipe dope may extrude from the casing when going down-hole, causing production and operational issues from the compounds on the interior of the wellbore.

The application of pipe dope on a rig involves using a brush to dip into the dope container and lather onto the pipe threads. In this exchange, there is high probability of dope spilling or dripping onto the rig floor. By nature, pipe dope is a viscous compound that may create an unsafe work surface and contribute to slip-and-fall injuries. Its omnipresence also raises concerns. When working with dope, it may often stick to work clothes in substantial amounts, leading to problems with laundering work clothes. An Oklahoma case study showed elevated levels of lead in the bloodstreams of oilfield workers' children.

HSE concerns and regulations by environmentally-proactive governments inspired a search for solutions to problems associated with leaded pipe dope. Green dopes that are lead-free and even metal-free were largely introduced into the oilfield supply market in the 1990's. These dopes effectively limit environmental lead discharge, but operational issues, an unsafe work surface, and questions of green dopes' efficacy may remain.

Another solution, dope-free technology, completely eliminates the need for pipe dope in storage and at the rig, thus eliminating HSE and operational risks associated with leaded and lead-free compounds. Tenaris' Dopeless® line of casing is made by application of a dry, multifunctional coating on the threads of pipes. While a high amount of VOCs are emitted in the process, simple VOC and NOx capture systems may be applied to create an overall cleaner emission and a friendly dope-free process.



The goals of this project were to:

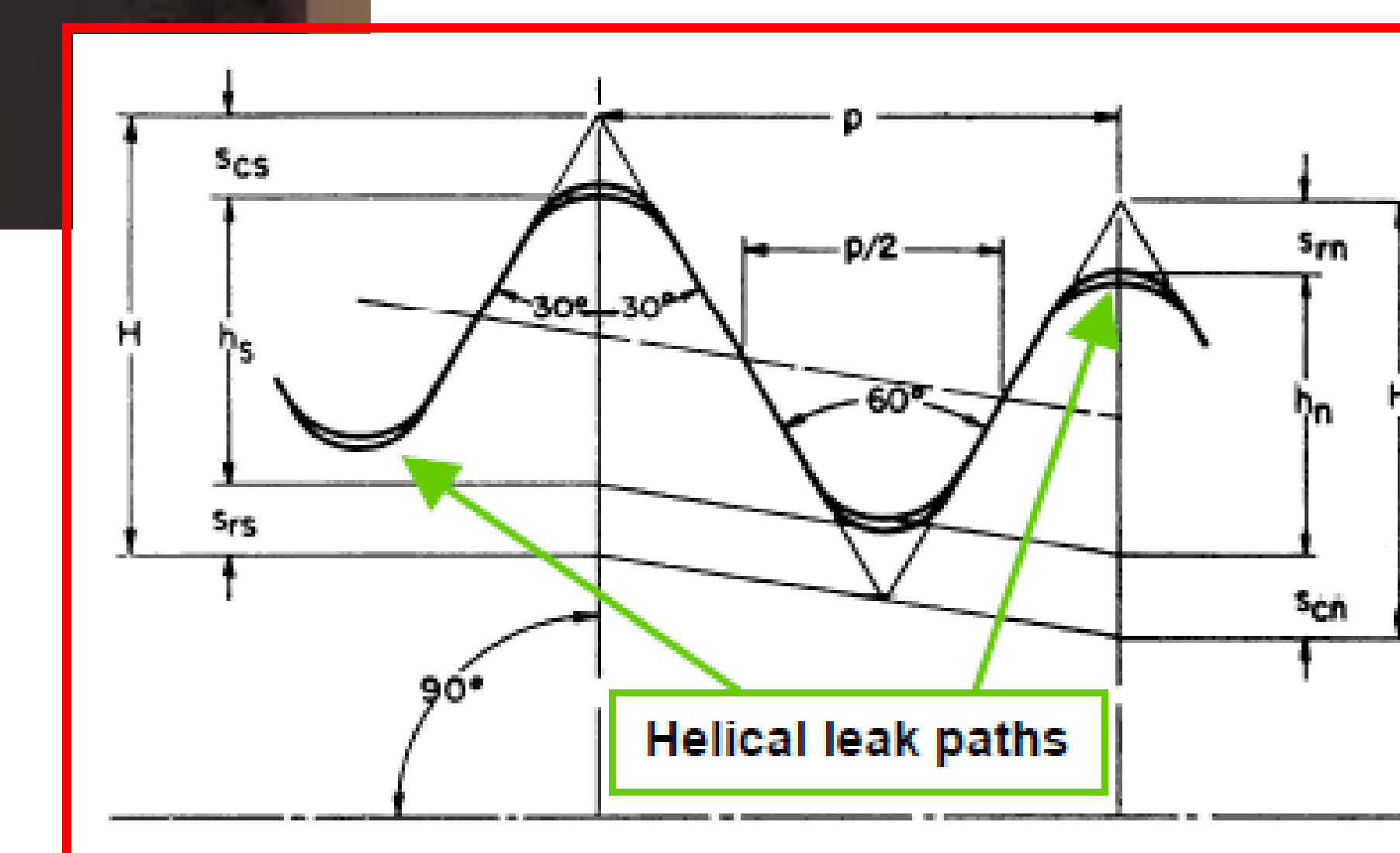
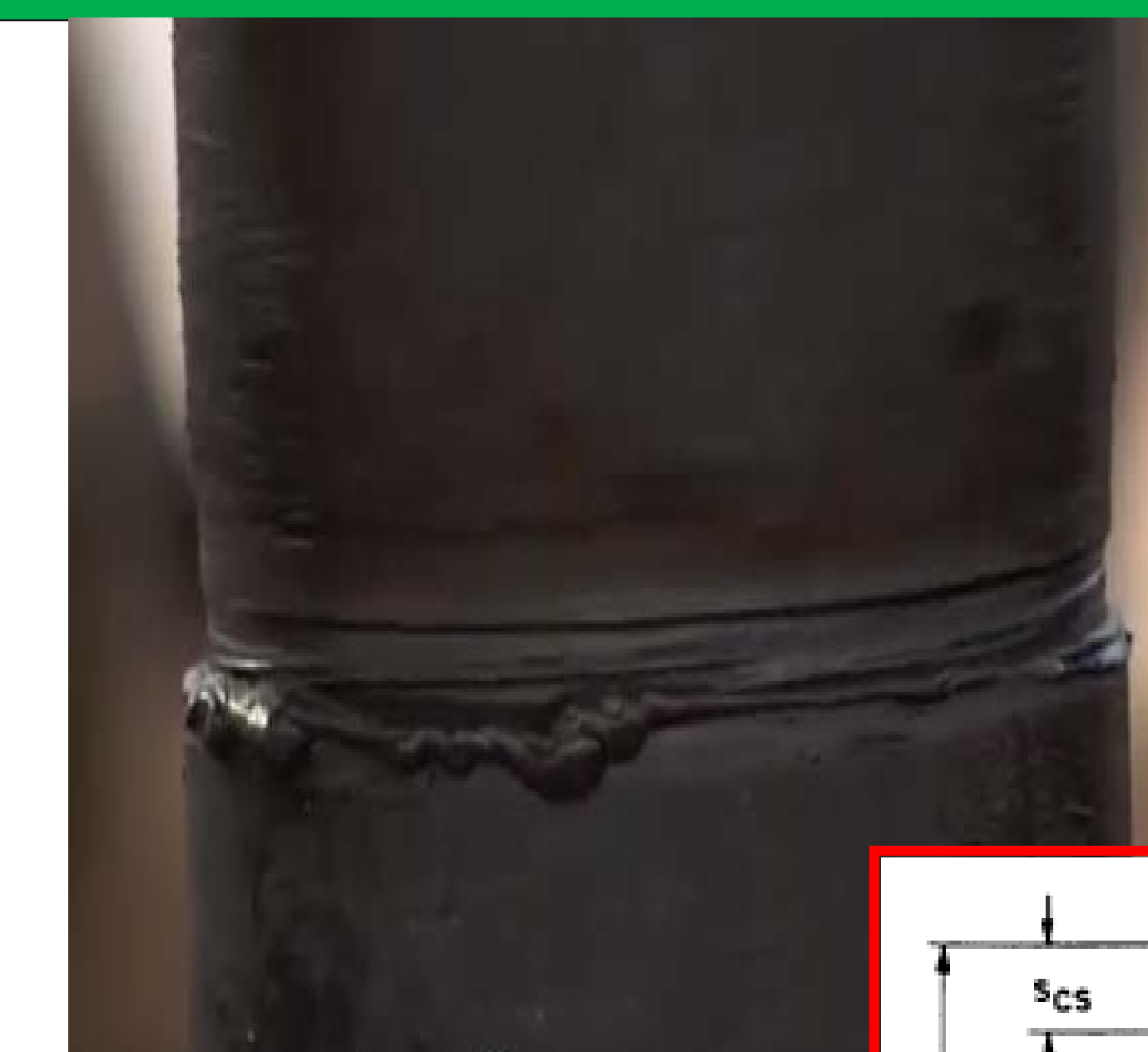
1. Establish an understanding of traditional pipe dope
2. Identify problems with the use of traditional pipe dope, and in doing so, point out the benefits to its suggested elimination
3. Review case studies and reports related to HSE and pipe dope
4. Discuss dope-free technology and other applications to reduce safety risks and environmental impact
5. Draw conclusions and produce feasible recommendations on the use of leaded pipe dope

Thread Protector Study Abstract

Thread protectors are a necessary accessory in the world of oil country tubular goods, allowing for the most vulnerable parts of the pipe or casing to be protected in transit or storage. After the protectors are taken off the pipe, they are oftentimes discarded; meanwhile, there exists a more environmentally-friendly process which should be used: reconditioning and reusing thread protectors.

Tenaris requests an investigation into the recycling of thread protectors for their Dopeless® line, including information on cleaning the un-doped protectors and grounds for accepting or rejecting used protectors. Referencing API specifications on casing, Tenaris' requirements for manufacturers, and issues that arose from a previous trial in using another company's refurbished protectors, several recommendations have been made for a recycling process internal to Tenaris. While the reference documents are based off manufacturing agreements for new protectors and *do not* apply to used protectors, they are good jumping-off points.

With these requirements and issues in mind, a rough recycling process has been developed to outline the steps to safely reuse thread protectors for dope-free pipe. The steps are: recovery, cleaning, inspection, reuse, and back to recovery. Recommendations for Tenaris to move forward with a process are also included, with discussions on outsourcing or internalizing parts of the process.



Component	Mass Fraction of Compound (%)	Mass Fraction of Solids (%)
Grease base	33.5% - 38.5%	0
Graphite	17% - 19%	28%
Lead powder	29.9% - 31.1%	47.5%
Zinc dust	11.6% - 12.8%	19.3%
Copper flake	3% - 3.6%	5.2%



Life Cycle of Pipe Dope

Manufacture

- Powdered graphite, lead, copper, and zinc in the air – health risks
- OSHA standards
- MSDS's, respirators, ventilation

Dope on Stored Pipe

- Pipe is manufactured, then doped with protectors
- Dope washed off upon arrival on-site, water use high
- Tenaris: 1200 liters/well cleaning threads
- 1000 liters/well cleaning protectors

Dope on Pipe Down-hole

- Dope brushed on in liberal amounts
- Pipe sent down-hole

