

# Polyisobutylene (PIB)-Based Fuel Additives



## Introduction

At Chevron Oronite, we foster a culture grounded in operational excellence and are conscientiously committed to protecting people and the environment. This product summary is one example of that commitment.

For engines to perform their everyday functions as well as expected, all their moving parts must be powered and protected with fuels and lubricants enhanced by some of the most technologically advanced additives. The products we produce help fuels and lubricants push the boundaries of speed, strength, cleanliness, and durability.

Polyisobutylene (PIB)-based deposit-control fuel additives are polymeric chemicals used as additives in engine fuel (such as gasoline) to keep sludge, soot, oxidation products, and other deposit precursors from forming deposits onto and harming key engine parts. These deposits can rob an engine of power, reduce fuel economy, and increase harmful emissions.

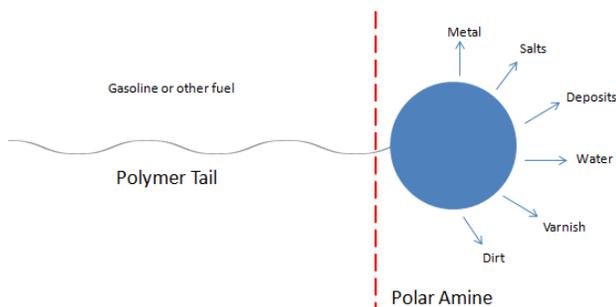


Figure 1. Diagram of a fuel additive in an engine environment

## Table of Contents

Introduction	1
Description and Properties	2
Health Information	3
Environmental Information	3
Regulatory Information	4
Exposure Potential	4

Making the things that go, **go better.**<sup>™</sup>



**Oronite**

Deposit-control additives protect both the combustion chamber and the fuel intake system, including fuel injectors and valves. Deposit-control additives can also be used to remove deposits in a dirty engine. Use of fuel containing a deposit-control additive is critical to helping to maintain engine performance over the life of your car.

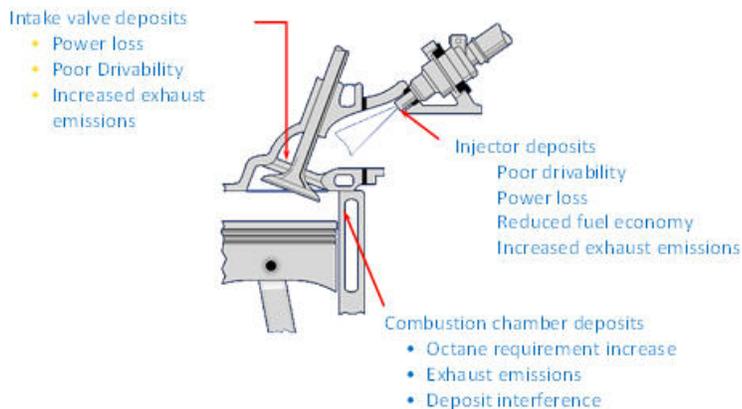


Figure 2. Diagram of a modern intake system showing potential deposit formation areas



Figure 3. Comparison of intake valve deposits before and after deposit control additive use

## Description and Properties

A basic diagram of a PIB-based fuel additive is shown in Figure 1. The product consists of a long hydrocarbon tail to make the additive soluble in gasoline or other fuels or oils, and a polar head, usually a nitrogen containing compound called an amine. The amine will attract and keep impurities or combustion and wear by-products such as water, metals, varnish, and dirt from depositing on intake system parts or combustion chambers.

These additives are typically prepared by starting with a polymer of polybutene, and then grafting on a polar function, such as an amine, by means of a polar linking group. In some cases the

Polyisobutylene (PIB)-based deposit-control fuel additives are polymeric chemicals used as additives in engine fuel (such as gasoline) to keep sludge, soot, oxidation products, and other deposit precursors from forming deposits onto and harming key engine parts.



polymer backbone may contain oxygen to improve the additive's effectiveness.

Proper function of these additives is critical to helping to keep injection systems clean, maximize engine fuel economy, prevent power loss, and keep emissions low. Figure 2 shows a diagram of a typical modern fuel injection system and combustion chamber, and illustrates where deposits can form in the absence of fuel additives.

## Health Information

Studies of PIB-based fuel additives by the dermal and oral routes of exposure indicate that these substances are relatively low in acute toxicity. They may cause respiratory irritation if inhaled. Signs of systemic toxicity occur only at very high dose levels that are much greater than human exposure that could result through use of products containing PIB-based additives.

Studies indicate that some PIB-based fuel additives are irritating to the skin or can be skin sensitizers. Some of these chemicals can be significant eye irritants. Toxicity studies conducted by oral gavage demonstrate that PIB-based fuel additives may cause developmental malformations at very high dose levels that are much greater than typical human exposure.

*In-vitro* and *in-vivo* studies demonstrate that these substances lack the potential to be genotoxic. Based on these studies, there is low concern that these substances are carcinogenic.

## Environmental Information

Based on test data, PIB-based fuel additives are not readily biodegradable and may cause long-term adverse effects in the aquatic environment. PIB-based fuel additives are not toxic to aquatic organisms. These substances are not expected to inhibit wastewater treatment plant microorganisms at typical discharge rates.

In the event that a product containing PIB-based fuel additives spills, stop the source of the release if you can do it without risk. The Material Safety Data Sheet provided with the product contains suggested spill response and clean-up procedures. As appropriate (or required) report spills to local authorities. In the USA the US Coast Guard can be reached at 1-800-424-8802.

PIB-based fuel additives are not toxic to aquatic organisms. These substances are not expected to inhibit wastewater treatment plant microorganisms at typical discharge rates.



## Regulatory Information

Requirements may exist that govern the manufacture, importation, sale, transportation, use, and/or disposal of PIB-based fuel additives or products containing them. These requirements may vary by jurisdiction. For more information, consult the relevant Material Safety Data Sheet (MSDS) or contact us.

## Exposure Potential

The low volatility and low water solubility of PIB-based fuel additives limits the potential for human exposure, and therefore risk, to people in the workplace and consumers. Indirect exposure to these chemicals via the environment is likely to be negligible. Also, exposure to these substances is low because they comprise only a fraction of the final fuel product.

Oronite Manufactures PIB-based fuel additives in dedicated closed systems with proper engineering controls in order to minimize potential human and environmental exposure. Oronite trains its workers in all phases of the manufacturing process and requires them to wear appropriate personal protection equipment. Oronite properly manages all manufacturing solid waste and waste water streams.

Professional mechanics, service station attendants, and other skilled workers that are frequently occupationally exposed to fuel additives while working on engines should use appropriate personal protective equipment and follow appropriate hygiene practices that reduce exposure to fuel. Consumers may potentially be exposed to small amounts of these substances by dermal contact if working around engines. Overall, potential human exposure to PIB-based fuel additives in either consumer or commercial settings is low.

In the event a product containing PIB-based fuel additives spills, stop the source of the release if you can do it without risk. The Material Safety Data Sheet provided with the product contains suggested spill response and clean-up procedures. As appropriate (or required), report spills to local authorities. In the USA the US Coast Guard can be reached at 1-800-424-8802.



**Oronite**

### Responsible Care Contact Information

Chevron Oronite Company LLC  
Global Responsible Care Manager  
6001 Bollinger Canyon Road, K2315  
San Ramon, CA 94583

[www.oronitegoes.com](http://www.oronitegoes.com)

### Disclaimer

Although the information on this Internet Web site and document are presented in good faith and believed to be correct, Chevron Oronite Co. LLC makes no representations or warranties of any kind, either express or implied, regarding this information or the products to which this information refers, including as to their completeness, accuracy, merchantability, fitness for a particular purpose or otherwise.

Readers are advised to make their own determination as to the suitability of any products for their purposes prior to use. In no event will Chevron Oronite Co. LLC be responsible for damages of any nature whatsoever resulting from the use of or reliance upon any of this information or the product to which this information refers.

Chevron Oronite Co. LLC makes no commitment to update or correct any information that appears on the Internet or on the World-Wide Web server.