WHO BENEFITS FROM ASPEN ALKYLATE FUEL?

MAN, MACHINE & THE ENVIRONMENT!

THE STORY OF HOW OUR ALKYLATE FUEL WAS FIRST USED

When using small engines, the user often is exposed to harmful gasoline vapors and exhaust gases.

In the late 1980's, loggers in Scandinavia reported adverse health problems, such as headaches and nausea (7, p36), which were believed to be caused by gasoline exhausts (8, p11).

Around the same time in America, the results of a study conducted by the International Agency for Research on Cancer (IARC) indicated that exposure to vapor and exhaust gases could be the reason loggers were getting blood cancer (3,p257).

Knowing this, we formulated a fuel for small engines, containing much less of some of the harmful substances found in ordinary gasoline.

Aspen alkylate fuel was successfully launched at a forest industry trade fair in Scandinavia in 1989 and almost overnight many loggers changed to alkylate fuel.

Today, most loggers in Scandinavia no longer consider the use of ordinary gasoline to be an option.

IN SHORT...

ORDINARY GASOLINE CONTAINS HARMFUL SUBSTANCES

A number of North American and International authorities such as the National Institute for Occupational Safety and Health (NIOSH), The Environmental Protection Agency (EPA), the Agency for Toxic Substances & Disease Registry, Health Canada, International Agency for Research on Cancer (IARC) and others have pointed at the dangers in components that can be found in ordinary gasoline, such as aromatics, benzene, sulfur and olefins. Some of the effects these substances can have on human health identified by the authorities, include dizziness, headaches, nausea, lassitude and abdominal pain. One of the potential effects of benzene, identified by NIOSH, is blood cancer (leukemia) (1; p26, 3; p257). Harmfull to your Health (10; 3,3,1).

OUR ALKYLATE FUEL CONTAINS LESS!

The California Environmental Protection Agency has identified a number of components that should be reduced in order to obtain a so-called cleaner-burning fuel (2):

- Benzene
- Olefins
- Aromatics
- Sulfur

As seen in the table, our fuel has very little or virtually none of the above listed substances.

Moreover, compared to ordinary gasoline, Aspen alkylate fuel is perceived to be nearly odorless.

CONTENT IN ASPEN ALKYLATE FUEL VS. AMERICAN ORDINARY GASOLINE

Max vol %

	Aspen alkylate fuel	American gasoline (9)
Benzene	0,1	0,8
Olefins	1	6*
Aromatic compounds, including BTEX***	1	25
Sulfur	<10	50**

**) California Tier 3 from 2003*
***) From 2017; <10*
****) BTEX = Benzene, Toluene, Ethylbenzene and Xylene.*

Our alkylate fuel has a high octane rating, is suitable for most fuel powered small engines, and has acquired a 27-year track record of success.

For the Canadian market.

ASPEN

Fuel for professionals

THE AUTHORITIES' VIEW ON ORDINARY GASOLINE

HARMFUL TO YOUR HEALTH

Human exposure to the harmful substances in gasoline can occur through direct inhalation, skin absorbation, ingestion and eye contac, or indirectly by drinking contaminated water, eating produce grown in contaminated soil, or breathing contaminated air.

Benzene, toluene, ethylbenzene and xylene (**BTEX**) are the most important toxic volatile compounds in the air and could be easily absorbed through the respiratory tract, and they are all found in ordinary gasoline. IARC and NIOSH both agree that **benzene** is carcinogenic to humans (3;p257, 4). NIOSH also identifies a number of other ways the BTEX substances can negatively effect the user: dizziness, headaches, nausea, lassitude, abdominal pain, dermatitis, anxiety, vomiting and liver and kidney damage, among others. (1;p26/133/311/336).

Olefins, which are a component of ordinary gasoline, contribute to the formation of ozone (5; p28). The following has been noted by the EPA about ozone's effect on human health: "even at low levels, breathing ozone can cause chest pains, coughing, and throat irritation. It can also aggravate lung diseases like emphysema, bronchitis, and asthma" (6). The EPA also says that the more ozone pollution a person breathes, "the more permanent damage it can do to her (or his) lungs".

! ***BUT Aspen alkylate fuel*** *is virtually free from benzene, and very low in olefins and other aromatic compounds, including BTEX.*

HARMFUL TO YOUR ENGINE

A report from 2013, issued by four associations within the automobile manufacturing industry (ACEA, Alliance, EMA and JAMA) states that "Heavy **aromatics**, and other high molecular weight compounds, have been linked to engine deposit formation, particularly combustion chamber deposits" (5; p28).

When caring for your engine you also need to take gasoline stability into account. Using aged ordinary gasoline that has started to break down may cause improper operation, and engine damage.

Allthough ethanol content in ordinary gasoline has environmental benefits, it can have negative effect on the reliability of your engine. According to the above mentioned report from 2013, "vapor pressure and distillation of ethanol- gasoline blends, at a minimum, must be carefully regulated to ensure proper vehicle operation and emissions control" (5; p32).

! ***BUT Aspen alkylate fuel*** *does not contain any ethanol, it is stable* compared to other gasoline; whether ethanol-free or not. In addition, it causes less engine deposits. This all leads to a better engine reliability with fewer breakdowns.*

** = Compared to the standard for ordinary American gasoline; ASTM D4814-14b. Test conducted using test method ASTM D525-12a, found that our fuel reached >11340 minutes, while the standard for ordinary American gasoline is >240 minutes.*

HARMFUL TO THE ENVIRONMENT

In the same report from 2013 the following is stated about **olefins**; "their evaporation into the atmosphere as chemically reactive species contributes to ozone formation and their combustion products form toxic dienes" (5; p28).

Even if you have an engine with a catalyst, there's reason to care what fuel you use. The same report from 2013 states that **sulfur** has a "significant impact on vehicle emissions by reducing the efficiency of catalysts" (5; p17).

Ordinary gasoline vapors and exhausts can also cause **odors** that bothers the user during inhalation, and can also leave him/her with clothes and hair that smell of gasoline.

BUT Aspen alkylate fuel *is virtually free from benzene, and very low in other harmful sustances such as sulfur, olefins and other aromatics, resulting in fewer negative impacts on both nature and the work environment.* !

WILL OUR ALKYLATE FUEL ADD VALUE FOR YOU, TOO?

Your customers and employees will experience:	**Added value for you? Can switching to alkylate fuel:**
Less harmful exposure to the fuel; • *Through skin contact during fueling* • *Through Inhalation of vapors and exhaust gases*	→ - *Lower your health-care costs?* - *Make you a more attractive employer?*
Less exposure of the environment to; • *Ground-level ozone* • *Odors*	→ - *Give you a competitive edge?* - *Help you sell more to satisfied customers?*
Machines that perform well thanks to; • *The elimination of ethanol* • *Clean combustion, minimizing the risk of breakdowns* • *The stability - you can leave it in the machine while stored*	→ - *Recude maintenance cost?* - *Give reliable machines?*

References

1. **NIOSH Pocket Guide to Chemical Hazards.** http://www.cdc.gov/niosh/docs/2005-149/pdfs/2005-149.pdf
2. **Article by California Environmental Protection Agency (EPA): "Cleaner-Burning Gasoline: An Update"**. http://www.arb.ca.gov/fuels/gasoline/cbgupdat.htm
3. **IARC Monographs, Publication by International Agency for Reseach on Cancer.** http://monographs.iarc.fr/ENG/Monographs/vol100F/mono100F-24.pdf
4. **Website page on benzene by The National Institute for Occupational Safety and Health (NIOSH)** http://www.cdc.gov/niosh/ershdb/emergencyresponsecard_29750032.html
5. **The 5th edition of The Worldwide Fuel Charter, by ACEA, Alliance, EMA and JAMA.** http://www.acea.be/uploads/publications/Worldwide_Fuel_Charter_5ed_2013.pdf
6. **Website by the government-backed program "AIRNow".** http://airnow.gov/index.cfm?action=ozone_facts.index
7. **Official State Investigation, published by The Swedish Transport Agency (Transportstyrelsen).** Available for download: https://data.kb.se/datasets/2015/02/sou/1995/ File name: 1995_30(librisid_17492006).pdf. 1995.
8. **Swedish State investigation about the technical specification for Alkylate fuel; TSV 2012-256.** 2014-05-23.
9. **American Gasoline standard: ASTM D4814-14b.** Available for purchase here: http://www.astm.org/Standards/D4814.htm
10. **Health Canada** is the Federal department responsible for helping Canadians maintain and improve their health, while respecting individual choices and circumstances. Read more, http://www.hc-sc.gc.ca/ewh-semt/pubs/contaminants/psl1-lsp1/benzene/index-eng.php#a331