DURATHERM
Heat Transfer Fluids

COMPARATIVE ANALYSIS

Duratherm, Therminol®, and Dowtherm™ Heat Transfer Fluids

The number of heat transfer fluids available on the market can make selecting the appropriate fluid an overwhelming process. Safety and chemical composition are two key factors that should be considered when choosing a fluid for your process. While worker and environmental safety should always be a priority, fluid compatibility between previously used and new fluids will also affect your choice. Duratherm, Therminol®, and Dowtherm™ all offer a variety of heat transfer products, but only one of the three offers a complete line of non-toxic and non-hazardous fluids – Duratherm.

www.Durathermcanada.ca

WORKER SAFETY

Ensuring a safe workplace begins with utilizing safe process fluids. While some products on the market are composed of chemicals that are classified as health hazards, Duratherm heat transfer fluids are formulated from non-toxic and non-hazardous components. This negates the need for specialized training or handling procedures. Disposal costs can also be lowered since no special permits are required.

Therminol® SP, ADX-10 and 55, along with Dowtherm™ Q, are formulated using benzene-based chemicals. Benzene is a colorless, or light yellow, colored liquid with a high vapor pressure that makes it flammable. When used at elevated temperatures, benzene will also release noxious fumes due to the vapor pressure of the fluid. Therminol® SP, ADX-10, and 55 have relatively low flash points that can pose an increased risk of fire if there is, for example, an accidental leak of fluid. The same is true for Dowtherm™ Q, with an advertised flash point of approximately 121°C (250°F).

Another potential hazard is the phenol-based compounds that exist within the Dowtherm™ RP and G, as well as the Therminol® 62 and 59, products. These phenol-based compounds can pose a severe health hazard when utilized at elevated temperatures. The vapors that are produced are highly toxic in low concentrations and explosive at some concentrations as low as 3%. These aromatic heat transfer fluids can also release benzene compounds at elevated temperatures, the risks of which are discussed below.

Table 1: Comparison of Flammability Data (Higher Numbers = Less Volatile).

Test	**Duratherm 630**	**Duratherm HF**	Therminol® 66	Therminol® ADX-10	Therminol® 55	Therminol® 59	Therminol® 62	Dowtherm™ Q	Dowtherm™ RP	Dowtherm™ G
Flash Point (°C)	230	276	170	136	166	132	160	121	194	137
Auto Ignition Point (°C)	375	393	374	327	343	372	407	412	385	432

When benzene fumes are inhaled, they can cause long-term illnesses in humans. Exposure to benzene fumes has been shown to cause bone marrow cells to not produce enough red blood cells, which will eventually lead to anemia. Benzene exposure has also been linked to birth defects and low birth weights.

Alkanes are another category of potentially dangerous chemicals that are used in Therminol's® products. Alkanes are typically found in a wide variety of store-bought solvents that usually require extensive safety warnings and careful handling, such as mineral spirits (white spirit). Similar to benzene, alkanes are also highly flammable and can pose serious health concerns. Acute exposure to alkanes has been linked to central nervous system damage and can produce chemical burns on the skin.

WORKER SAFETY Continued

Phenol-based compounds, such as those found in Dowtherm™ heat transfer fluids, are aromatic organic molecules that are typically acidic and known for causing chemical burns. These compounds are also toxic to humans, even in low concentrations. Ingestion of as little as 1 gram can be fatal to adults, while smaller amounts are linked to reproductive toxicity. Inhalation of phenol-based compounds can also lead to severe respiratory issues, such as edema. The toxicity towards humans also carries over to the environment, with the ability to contaminate ecosystems in very small quantities.

The terphenyls found within Therminol® 66's formulation are a group of chemicals that can also pose serious health risks. These aromatic hydrocarbons are highly toxic, as indicated by their permissible exposure limits of approximately 0.5 ppm. Their toxicity to mammals is also heavily documented. The tables below illustrate the toxicity of these chemicals on common test animals.

Table 2: Mammalia Toxicity (Lower Value = More Toxic).

Mammalia Toxicity	Duratherm 630	Therminol® ADX-10	Therminol® SP	Therminol® 66	Therminol® 55	Therminol® 59	Therminol® 62
Oral Toxicity	>5,000mg/kg – Non-toxic	2,000 mg/kg	1,000 mg/kg	2,000 mg/kg	1,580 mg/kg	3,000 mg/kg	3,000 mg/kg
Dermal Toxicity	0 – Non-Irritant	2,000 mg/kg	3,600 mg/kg	2,000 mg/kg	7,940 mg/kg	5,000 mg/kg	5,000 mg/kg

Table 3: Mammalia Toxicity (Lower Value = More Toxic)

Mammalia Toxicity	Duratherm 450	Duratherm HF	Dowtherm™ Q	Dowtherm™ RP	Dowtherm™ G
Oral Toxicity	>5,000 mg/kg – Non-toxic	>5,000 mg/kg – Non-Toxic	5,000 mg/kg	2,000 mg/kg	2,322 mg/kg
Dermal Toxicity	0 – Non-Irritant	0 – Non-Irritant	5,000 mg/kg	2,000 mg/kg	2,000 mg/kg

In comparison, Duratherm's heat transfer fluids do not contain any of the dangerous chemicals that were previously described. They are formulated with 100% non-toxic and non-hazardous componentry, and do not require any special handling or disposal procedures. The fluids can be disposed of in the same manner as standard used oils. The exceedingly low vapor pressure of our fluids greatly minimizes the production of vapors, even under high process temperatures. The high flash points improve safety by helping eliminate the fire hazard that is typically associated with other heat transfer fluids.