





## 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.

## ENVIRONMENTAL SAFETY

While employee safety is always a major concern, environmental safety must also be considered during fluid transitions. Reducing the amount of toxic by-products that are released by industrial processes ensures minimal impact on the earth. Choosing environmentally-friendly fluids is an ideal way to reduce this impact.

The chemicals commonly utilized in Therminol® and Dowtherm™ products – benzene, alkanes, phenols and terphenyls – are just as toxic to the environment as they are to humans. Eco-friendly fluid choices, such as Duratherm’s heat transfer fluids, reduce potential liability from accidental spills and are also inherently biodegradable.



**Table 4: Eco-toxicity Comparison (Higher Number = Lower Toxicity).**

Eco-Toxicity	Duratherm 630	Therminol® SP	Therminol® 66	Therminol® ADX-10	Therminol®55	Therminol®59	Therminol® 62
Algae Toxicity	>100,000 mg/L	2.08 mg/L	0.103 mg/L	1,000 mg/L	1,000 mg/L	0.67 mg/L	10.1 µg/L
Fish Toxicity	>100,000 mg/L	100 mg/L	27 mg/L	1,000 mg/L	1,000 mg/L	0.97 mg/L	8.24 µg/L
Other Aquatic Invertebrates Toxicity	>100,000 mg/L	1.4 mg/L	22 µg/L	1.0 mg/L	600 mg/L	0.3 mg/L	4.52 µg/L
Biodegradability	Inherently Biodegradable	Not Readily Biodegradable	Not Readily Biodegradable	Not Readily Biodegradable	Not Readily Biodegradable	Not Readily Biodegradable	Not Readily Biodegradable

**Table 5: Eco-toxicity Comparison (Higher Number = Lower Toxicity)**

Eco-Toxicity	Duratherm 450	Duratherm HF	Dowtherm™ Q	Dowtherm™ RP	Dowtherm™ G
Algae Toxicity	>100,000 mg/L	>100,000 mg/L	<1 mg/L	0.07 mg/L	<1mg/L
Fish Toxicity	>100,000 mg/L	>100,000 mg/L	<1 mg/L	0.0225 mg/L	5.7 mg/L
Other Aquatic Invertebrates Toxicity	>100,000 mg/L	>100,000 mg/L	0.17 mg/L	0.062 mg/L	0.1 mg/L
Biodegradability	Inherently Biodegradable	Inherently Biodegradable	Not Readily Biodegradable	Not Readily Biodegradable	Not Readily Biodegradable

The data presented on the Therminol® and Dowtherm™ products’ chemical compositions indicates that they can pose a risk to the health of aquatic life, even in very low or minimal concentrations. Some of the Therminol® and Dowtherm™ products that are listed are not readily biodegradable as well. This could lead to an increased liability for the plant in the event of an accidental discharge. **Duratherm 630’s** formulation is non-toxic, inherently biodegradable and safe for aquatic life, even in high concentrations.

# FLUID PROPERTIES COMPARISON



Fluid	Duratherm 630	Duratherm HF	Therminol® 66	Therminol® 55	Therminol® SP	Therminol® 62	Dowtherm Q	Dowtherm G	Dowtherm RP
Max Bulk Temp. (°C)	332	338	345	305**	315	325	330	360	350
Min Use Temp - Vis @300°C cSt*	5	24	13	-8	-7	-9	n/a	n/a	n/a
Flash Point (°C)	229	276	184	193	177	171	120	137	194
Vis @40°C	42.31	103.21	29.6	36.8	18.99	10.7	2.37	6.35	14.92
Vis @ Max Temp	0.73	0.71	0.43	0.45	0.53	10.7	0.17	0.21	0.31
Heat Capacity @ Max Temp (kJ/kg-K)	2.971	2.392	2.889	2.950	2.860	2.580	2.587	2.735	2.602
Thermal Conductivity @ Max Temp (W/m-K)	0.127	0.144	0.084	0.094	0.097	0.090	0.077	0.087	0.089
Vapor Pressure @ Max Temp (kPa)	15.03	23.06	148.1	48.70	27.20	86.07	495	437	142

Fluid	Duratherm 450	Therminol® ADX-10	Duratherm LT	Therminol® 59	Duratherm XLT-120	Duratherm XLT-50	Therminol® D12
Max Bulk Temp. (°C)	232	250	315	315	65	121	230
Min Use Temp - Vis @300°C cSt*	-53	-43	-31	-38	-93	-65	-80
Flash Point (°C)	150	136	165	132	49	85	59
Vis @40°C	4.61	4.03	7.98	4.04	0.98	5.57	1.239
Vis @ Max Temp	0.68	0.39	0.53	0.32	0.77	0.86	0.277
Heat Capacity @ Max Temp (kJ/kg-K)	2.725	2.720	3.102	2.680	2.158	2.361	2.971
Thermal Conductivity @ Max Temp (W/m-K)	0.129	0.090	0.123	0.089	0.133	0.135	0.070
Vapor Pressure @ Max Temp (kPa)	19.82	37.00	64.75	162.00	2764	21.51	228.7

\*Subject to user system/pump capabilities

\*\*Bulk temp, not extended use temp