

## FloraSolv™ LX311

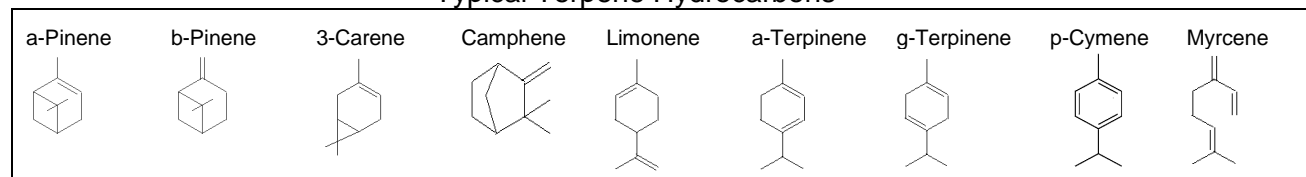
### Description:

FloraSolv™ LX311 is a specialty solvent blend of Terpene Hydrocarbons that have been sourced from 100% renewable processes. The composition has been formulated to match or exceed the solvency of d-Limonene while also possessing a mild Orange/Citrus fragrance. Combining dl-Limonene with several of its isomers (eg: Terpinolenes and Terpinenes), enhances the solvency for non-polar soils. Due to the structural similarity to Limonene, the Hansen Solubility Parameters are close to those of Limonene, which eliminates the need for significant changes to cleaner formulations. BHT is added to stabilize the blend against oxidation.

### Chemistry

Terpenes are naturally occurring 10-carbon organic molecules manufactured in nature by green plants. They are the raw materials for many of the flavors and fragrances enjoyed by man. Most terpenes are designated GRAS (Generally Recognized As Safe) by the FDA and FEMA (Flavor Extracts Manufacturing Association) and are approved for human consumption in foods.

#### Typical Terpene Hydrocarbons



### Sources of Terpenes

The pine tree is the world's largest commercial source of terpenes. Turpentine, the volatile oil from the tree, is the largest volume essential oil found in nature..

The second largest source of terpenes is citrus oil (primarily d-limonene from orange oil) which is produced as a by-product of orange juice production. Citrus Terpenes have found use in many industrial and consumer cleaning products worldwide.

Florachem is an expert at optimizing the effectiveness, availability and economy of solvents and cleaners produced from these other natural resources.

### Performance Comparison

FloraSolv LX311 has a higher non-polar solvency and a broader range of solvency than many other common solvents. Unlike glycol ethers they are predominantly non-polar and therefore have a high affinity for the dissolution of non-polar soils. For this reason it is frequently formulated into cleaning compounds with surfactants, builders, polar co-solvents and occasionally water.

September 2018

*The information and statements herein are believed to be reliable, but are not to be construed as a warranty or representation for which we assume legal responsibility. Users should undertake sufficient verification and testing to determine the suitability for their own particular purpose of any information or products referred to herein. NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS MADE. Nothing herein is to be taken as permission, inducement or recommendation to practice any patented invention without a license.*

## Physical Properties

The Hansen Solubility Parameters of Florasolv LX311 have been estimated using the QSAR functionality found in Version 5.0 of HSPiP. For comparison purposes, they are shown below relative to the parameters generated for Limonene using the same model.

Solvent	$\delta_d$	$\delta_p$	$\delta_h$
d-Limonene	16.60	1.69	3.68
FloraSolv LX311	17.41	1.75	3.59

	Kauri-Butanol Value	Relative Degreasing Performance
FloraSolv LX311	~100	Excellent
d-Limonene	67	Excellent

Approximate Physical Properties	d-Limonene	FloraSolv LX311
Specific Gravity @ 25°C	0.84	0.87
Pounds/Gallon @ 25°C	7.0	7.2
Flash Point, °F, TCC	123	118
Evaporation Rate (n-BuAc = 1)	0.2	0.2
Vapor Pressure (mmHg @ 20°C)	2.5	2.0
Surface Tension (dynes/cm @ 25°C)	28	27
Initial Boiling Point, °C (@ 760 mmHg)	175	170
Freezing Point, °C	< -80	< -80
Viscosity, cps, @ 25°C	1.5	1.5
Solubility in Water, %	<0.2	<0.2
Non-Volatile Residue (@ 105°C)	< 0.5	< 0.5
Kauri-Butanol Value (KB)	67	~100
Resistivity (Megohms/cm)	2.6 X 10 <sup>6</sup>	2.6 X 10 <sup>6</sup>
Dielectric Breakdown, KV (ASTM D877)	30	30
Color, APHA (Typical)	<30	<30

## Regulatory Advantages of Terpenes

Because FloraSolv LX311 is a blend of terpenes, it is non-toxic, biodegradable, and contains no dangerous chemicals or additives. FloraSolv LX311, for instance, contains no chlorinated components and therefore does not affect the Earth's ozone layer and is not regulated under the Montreal Protocol. In addition, FloraSolv LX311 contains no components that are classified as Hazardous Air Pollutants (HAPS) by the Clean Air Act Amendments. Because terpenes are naturally occurring and safe, the EPA has endorsed terpenes as replacements for hazardous solvents like 1,1,1-trichloroethane and CFC-113 under the Significant New Alternatives Policy (SNAP) program.

The table below compares the regulatory status of several traditional industrial solvents with FloraSolv LX311:

Solvent Regulatory Status Comparison

	SARA Title III Section 313 Toxic	Clean Air Act Hazardous Air Pollutant	Ozone Depleting	California Proposition 65 Carcinogen
FloraSolv LX311	No	No	No	No
1,1,1-Trichloroethane	Yes	Yes	Yes	No
Methyl Ethyl Ketone	Yes	Yes	No	No

September 2018

*The information and statements herein are believed to be reliable, but are not to be construed as a warranty or representation for which we assume legal responsibility. Users should undertake sufficient verification and testing to determine the suitability for their own particular purpose of any information or products referred to herein. NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS MADE. Nothing herein is to be taken as permission, inducement or recommendation to practice any patented invention without a license.*

Mineral Spirits	No	No	No	No
Trichloroethylene	Yes	Yes	No	Yes
Perchloroethylene	Yes	Yes	No	Yes
Xylene	Yes	Yes	No	No
Glycol Ether EB	Yes	Yes	No	No

### Terpene Vapor Emissions and Odor

Since terpene odors are easily detectable, it is sometimes thought that terpenes rapidly vaporize, leading to high vapor concentrations in the air. This is because the odor threshold (level at which terpenes can be detected by smell) can be as low as 1 part-per-million (ppm). This is much lower than many traditional industrial solvents. However, FloraSolv LX311 has a very low volatility which means very low vapor concentrations occur during use. Despite this fact, adequate ventilation is always required in the workplace.

An indication of the relative vapor exposure hazard of a solvent is a ratio called the Inhalation Hazard Index (IHI). This parameter is defined as the ratio of the saturated vapor concentration at 20°C to the American Conference of Industrial Hygienists (ACGIH) TLV-TWA. The higher the ratio, the quicker the vapor concentration will approach the maximum safe concentration, at which point it can become a potential health risk. The following table compares the IHI for several common solvents. Note that FloraSolv LX311, has a lower (safer) value than other high performance industrial solvents:

### Inhalation Hazard Index for Industrial Solvents

	Vapor Pressure (mmHg @ 20°C)	TLV-TWA (ppm)	Inhalation Hazard Index	Odor Threshold (ppm)
FloraSolv LX311	2	100	25	1
Mineral Spirits	2	100	25	800
Glycol Ether EB	0.9	25	46	20
Xylene	9.5	100	125	20
Perchloroethylene	13	50	342	50
1,1,1-Trichloroethane	100	350	376	400
Methyl Ethyl Ketone	85	200	559	25
Trichloroethylene	59	50	1552	250

### Toxicity

Most terpenes are non-toxic by OSHA standards. Many have been extensively tested by the Flavor Extracts Manufacturers Association (FEMA) and other groups. Refer to the SDS for current data.

### Product Packaging / Container Suitability

Terpenes are very aggressive solvents and care must be taken in choosing containers for terpene products. Polyethylene bottles typically do not perform well with terpenes. Although the polyethylene is not weakened, the terpene solvents diffuse through the sides of the container. High density polyethylene (HDPE) bottles, which have been fluorinated, may be used.

Florachem has found that PVC or PET bottles perform well for cleaners containing terpene solvents but they will still show some permeation over long storage periods.

Contact your container supplier for more information.

September 2018

*The information and statements herein are believed to be reliable, but are not to be construed as a warranty or representation for which we assume legal responsibility. Users should undertake sufficient verification and testing to determine the suitability for their own particular purpose of any information or products referred to herein. NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS MADE. Nothing herein is to be taken as permission, inducement or recommendation to practice any patented invention without a license.*

### Safe Handling of Terpene-Soaked Rags

It is widely known that oily rags may spontaneously combust when placed in containers. Terpene-soaked rags are no exception. To prevent this, terpene-soaked rags should be washed or submerged in water (a small amount of soap or detergent added will cause the rags to wet more easily).

### Flash Point and Safety

Most terpene solvents are considered flammable or combustible. However, unlike traditional flammable solvents like MEK and acetone, their flash points are sufficiently high enough to permit safe use in most applications. OSHA regulations require that solvents in artificially heated dip tanks be maintained at a maximum temperature 50°F below their flash points. Please refer to SDS.

September 2018

*The information and statements herein are believed to be reliable, but are not to be construed as a warranty or representation for which we assume legal responsibility. Users should undertake sufficient verification and testing to determine the suitability for their own particular purpose of any information or products referred to herein. NO WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE IS MADE. Nothing herein is to be taken as permission, inducement or recommendation to practice any patented invention without a license.*