

Additives for Biobased Products



Thickeners for Biobased Lubricants.3
Low Temperature Performance of Thickeners for Biobased Lubricants.4
Cold Flow Improvers for Vegetable Oil Based Lubricants4
Tackifiers for Biobased Lubricants and Esters.5
Additives for Biobased Hydraulic Fluids.6
Saw Guide Oil Additive Package.6
Open Gear Oil Additive Package.6
Multifunctional Rock Drill Package.7
Anti-oxidant for Biobased Lubricants7

QMS Certified to ISO 9001:2008 (With Design) REACH and GHS Compliant

FUNCTIONAL PRODUCTS INC.

Functional Products Inc. was founded in 1985. The Quality Management System is certified to ISO 9001:2008 (with design). Functional Products is committed to compliance with current REACH and CLP regulations, including the Globally Harmonized System (GHS) for classification and labeling standard.

Functional Products is an active member or participant in the following professional technical associations: **NLGI, ELGI, NLGI India, STLE, KSTLE, AOCS, NSF, UEIL and ILMA.**

Functional Products formulates and blends over 200 active products and also provides custom formulary capability for short and long-run needs.

Headquarters, general offices and manufacturing plant are located in Macedonia, Ohio. Sales offices and stocking points are located throughout the United States and Canada, as well as Latin America, Europe, Australia, India and Asia.

Mission Statement:

Functional Products Inc. is committed to providing our customers with quality products and services that meet or exceed their expectations through the use of continuous improvement.

Health and Safety:

The product descriptions here, in Technical Data Sheets (TDSs) and on product labels are not intended to take the place of a Safety Data Sheet (SDS).

An SDS is provided with each order or sample shipment and can be downloaded from our website:

www.functionalproducts.com
Phone: 1-330-963-3060

Additives for Biobased Lubricants

Why Convert from Mineral to Biobased Fluids?

As environmental concerns are growing, vegetable oils are finding their way into total-loss lubricants for military applications and outdoor activities such as forestry, mining, railroads, dredging, fishing and agricultural hydraulic systems. Lubricants based on vegetable oils offer significant environmental benefits as well as providing satisfactory performance in a wide array of applications. Government initiatives and advances in biobased lubricant technology are expanding the market for environmentally friendly products.

Shortcomings of vegetable oils, such as low thermo-oxidative stability and poor cold flow behavior, may be improved through the use of additives that enhance oxidative stability, improve low temperature properties (pour points) and confer better wear properties.

FUNCTIONAL PRODUCTS' additives in this catalog improve the performance of commercially available biobased industrial oils such as hydraulic fluids, biodegradable oils for heavy equipment, biobased drip fluid for agricultural equipment including mineral oil-based lubricants for high-temperature applications.

Converting Machinery to Biobased Lubricants

When switching from a mineral oil-based rock drill, bar and chain, gear oil or hydraulic fluid to a biobased system, certain care should be exercised:

- Warm up the machinery to reduce the viscosity.
- Flush the sump and/or system with vegetable oil, circulate and drain.
- Fill with biobased fluids.
- Note the clarity and color of the oil.
- Inspect the machinery fluids frequently in order to learn how the fluid behaves.

Spent fluids may be recycled with filtration and in some cases may be revived with booster additives.

Compatibility

All **FUNCTIONAL PRODUCTS'** biobased additives are compatible with vegetable oils. Most additives are also compatible with some synthetic esters. See the Technical Data Sheets for specific information regarding ester compatibility.

Definitions

Biobased — According to the Office of the Federal Environmental Executive, biobased products are commercial or industrial products (other than food or feed) that are composed in whole or in significant part of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials. In the past, The United States Department of Agriculture (USDA) generally described biobased in reference to products, including lubricants and greases, that were made of at least 51% biological materials.

Thickeners for Biobased Lubricants

Triglyceride oils are preferred as base stocks for blending hydraulic gear oils, rock drill oils and lubricants intended for use in environmentally sensitive applications. A drawback is the low viscosity of <40 cSt at 40°C. A thickener may be used to provide higher viscosity, and a tackifier may be used to provide tack to the finished product.

FUNCTIONAL V-508, 508M, V-515 and **V-521** are thickeners for vegetable or animal-based oils to blend lubricants of ISO 46, ISO 68 or ISO 100 viscosity grades. **FUNCTIONAL V-516** is a thickener for high oleic vegetable oils used to blend lubricants of ISO 46, ISO 68 or ISO 100 viscosity grades. These thickeners are ideal for use with synthetic esters. **FUNCTIONAL V-508** and **V-508M** are best for use with dioctyl adipate, ditridecyl adipate, C₆, C₇, C₈ polyol esters, trimethylolpropane tricaprylate and trioctyl trimellitate. **FUNCTIONAL V-515** and **V-516** are best with triisodecyl trimellitate and diisodecyl phthalate.

FUNCTIONAL V-508F is a thickener for vegetable or animal-based fatty oils, used to blend lubricants of ISO 46 or ISO 68 viscosity grades. **V-508F** has excellent high-temperature properties, is shear stable, and has a PSSI of 28%. With approximately 70% biodegradable content, **V-508F** is biodegradable under all widely used standards.

FUNCTIONAL V-521 is a shear stable (30% PSSI) thickener for vegetable or animal-based oils. **FUNCTIONAL V-521** does not have as large an impact on low temperature performance of the thickened oils as other thickeners.

FUNCTIONAL V-508, V-508F and **V-508M** are LuSC listed for EU Ecolabel formulations and suitable for use in Vessel General Permit (VGP) applications.

Typical Properties					
	V-505	V-508F	V-515	V-516	V-521
Compatibility	High-oleic canola oil, esters, dioctyl adipate, trimethylpropane trioleate				
Specific Gravity	.93	0.93	0.93	0.91	0.93
Lbs. per Gallon	7.75	7.75	7.75	7.60	7.75
Flash Point	150°C (300°F)	150°C (300°F)	150°C (300°F)	>260°C (500°F)	150°C (300°F)
Shear Stability, PSSI (ASTM 6278)	15%	29%	51%	51%	30%
Kinematic Viscosity @ 100°C	8000 cSt	7000 cSt	8000 cSt	5500 cSt	5000 cSt
Color (ASTM D1500)	Yellow (<4)	Yellow (<4)	Yellow (<4)	Yellow (<2)	Yellow (<2)

Treatment Levels in High-oleic Canola			
	ISO 46	ISO 68	ISO 100
V-505	1.0%—3.0%	5.5%—7.5%	9.5%—12%
V-508F	2.0%—2.5%	4.5%—5.0%	8.0%—9.0%
V-508M	3.0%—3.5%	7.0%—7.5%	13%—14%
V-515	2.0%—2.5%	6.0%—7.0%	15%—16%
V-516	1.5%—2.0%	5.0%—6.0%	12%—15%
V-521	3.0%—4.0%	8.5%—9.5%	13.5%—14.5%

Warming **FUNCTIONAL PRODUCTS'** biobased additives to 65°C (150°F) may facilitate pumping and handling. Extended storage at elevated temperatures is not recommended for any product derived from vegetable oils. Safe handling precautions are the same as those to be used with vegetable oils; see the current Safety Data Sheet for details.

Low Temperature Performance of Thickeners for Biobased Lubricants

Pour points were determined for solutions of **FUNCTIONAL V-508F** and **V-515** in high-oleic canola oil (H-OC), dioctyl adipate (DOA) and trimethylpropane trioleate (TMPTO).

	V-508F			V-515			V-521		
	H-OC	DOA	TMPTO	H-OC	DOA	TMPTO	H-OC	DOA	TMPTO
Performance without PD-555C									
Haze Onset (°C)	-12	-12	-15	-12	-25	-18	-13	-38	-17
Pour Point (°C)	-15	-9	-12	-19	<-50	-19	-22	<-50	-22
Performance with PD-555C									
Haze Onset (°C)	-22	-12	-18	-22	—	-22	-17	-44	-20
Pour Point (°C)	-25	-15	-22	-25	—	-34	-27	<-50	-34

● Solutions in H-OC and DOA were prepared to be ISO 46, while TMPTO solutions were prepared to be ISO 68 (TMPTO is ISO 46 without additives).

Cold Flow Improvers for Vegetable Oil Based Lubricants

FUNCTIONAL PD-551, PD-555C and **PD-590** modify wax crystal formation in biobased lubricants. Their primary use is to improve the cold flow properties of biobased lubricants at temperatures below the cloud point. These products are effective under both rapid-cooling and extended cold-storage conditions. Cold flow improvers are effective in hydraulic fluids, chain saw oils, pneumatic tool lubricants and other lubricants made from canola oil, sunflower oil or other triglycerides. The low viscosity of **PD-555C** makes it very easy to handle.

FUNCTIONAL PD-590 meets EPA Safer Choice and CleanGredients criteria.

Typical Properties			
	PD-551	PD-555C	PD-590
Diluent	Vegetable Oil	N/A	Vegetable Oil
Appearance	Light-colored Liquid	Light-colored Liquid	Light-colored Liquid
Odor	Mild	Mild	Mild
Specific Gravity	0.93	0.93	0.93
Lbs. per Gallon	7.75	7.75	7.75
Flash Point	>160°C (320°F)	>160°C (320°F)	>150°C (300°F)
Kinematic Viscosity	200 cSt at 100°C 1200 cSt at 40°C	300 cSt at 100°C —	1500 cSt at 100°C —

To reduce the pour point of canola or other low-saturate triglyceride oils to below -23°C (-10°F), a treatment of 0.3% to 0.5% is usually sufficient. To reduce the pour point to below -29°C (-20°F), a treatment of 0.5% to 1.0% is usually sufficient. For stability in extended storage at -23°C (-10°F), a treatment level of 1.0-2.5% is usually necessary. Since the responsiveness of triglyceride to wax-crystal modifiers is extremely variable and may be dependent on the cooling history, the user should determine the appropriate treatment level.

Tackifiers for Biobased Lubricants and Esters

Biobased tackifiers are additives that confer tack or stringiness to lubricants made from vegetable or animal based fatty oils. They are principally used to provide adherence in chain oils, saw guide oils, down hole drilling oils, open gear oils or oils used to lubricate in baking or food processing facilities. They may also be used to inhibit stray mists or to provide drip resistance in other products. They may also be used to provide thickening and tack in oils that contain high levels of fatty additives, such as cutting oils.



Nonfoods Compounds
Program Listed

FUNCTIONAL V-584 has been approved by the NSF as an additive for lubricants with incidental food contact (#120913, category HX-1, HX-2) and is LuSC listed for EU Ecolabel formulations and suitable for use in Vessel General Permit (VGP) applications. It is principally used to provide adherence in chain oils in environmentally sensitive or food-processing locations. It will also inhibit stray mists and provide drip resistance. In order to add tack to vegetable oil based single use lubricants, **FUNCTIONAL V-584** may be used at a lower treatment level.

FUNCTIONAL V-592 is recommended for use with synthetic esters and blown or polymerized vegetable oils that can be difficult to additize. A unique blend of synergistic polymers, **FUNCTIONAL V-592** imparts tackiness and adhesion to synthetic esters.

Typical Properties

	V-515	V-584	V-592
Compatibility	Vegetable Oil	Vegetable Oil	Vegetable Oil, Blown Vegetable Oil, Synthetic Esters
Lbs per Gallon	7.75	7.75	7.95
Flash Point	150°C (300°F)	150°C (300°F)	150°C (300°F)
Kinematic Viscosity	8000 cSt at 100°C	2500 cSt at 40°C	900 cSt at 100°C
Thickening Efficiency (10% in Canola Oil)	75 cSt at 40°C	60 cSt at 40°C	70 cSt at 40°C
Color (ASTM D1500)	Yellow-orange (<4)	Yellow-orange (<3)	Light Yellow (<1)

A treatment level as low as 1% will provide tackiness in a vegetable oil. The typical treatment level for a chain lube is 3-7%; about 5% will bring a vegetable oil to ISO 46 and 10% to ISO 68. Due to its high viscosity index, a fatty-oil derived ISO 46 product may actually have a higher viscosity at 100°C than many ISO 100 mineral based products. The slight residual haze in these higher viscosity blends does not affect performance. A treat level of between 0.2% and 1.0% of **FUNCTIONAL PD-551** or **PD-555C** can inhibit the freezing of the base oil, extending the usable temperature range of the lubricant. Minimization of hydrocarbon aerosol escape from mist lubricated and pneumatic equipment requires about 1%. Since there are no standardized test methods for tackiness or stray-mist inhibition, the appropriate treatment level is best determined by the user.

While warming **FUNCTIONAL V-515** to about 65°C (150°F) or **FUNCTIONAL V-584** to about 50°C (120°F) may facilitate pumping and handling, extended storage of these or any other vegetable oil derived products at elevated temperatures is not recommended. For best tackiness retention, do not warm above about 65°C (150°F).

Safe handling precautions are the same as those to be taken with vegetable oils; see the current Safety Data Sheet. **FUNCTIONAL V-584** and **V-515** have a shelf life of 6 months. Avoid mechanical shearing during handling and blending to minimize possible loss of tackiness.

Additives for Biobased Hydraulic Fluids

FUNCTIONAL HF-546 is an additive package for producing ISO 46 hydraulic fluids. It is formulated to provide excellent antiwear and corrosion resistance, oxidative stability, foam resistance, cold flow properties and resistance to water. **HF-546** and **HF-580** are compatible with TMP trioleate diluents for increased thermal and oxidative stability.

FUNCTIONAL HF-580 is a non-hazardous light color, low odor additive package which is compatible in a wide variety of base oils including vegetable oils, high oleic algal oils, modified castor oils and synthetic esters including TMP and pentaerythritol esters. It also has outstanding solubility in Groups III and IV oils (PAOs) as well as OSP fluids. **HF-580** can be formulated in high oleic canola oil to ISO 46 grade using approximately 2.5% **FUNCTIONAL PD-551** as a highly shear stable thickener. The ISO 46 grade passes the V104C Vane Pump Test (ASTM D7043) and exhibits excellent demulsibility, rust and copper inhibition, 4-ball wear performance and

hydrolytic and thermal stability. **FUNCTIONAL HF-580** shows exceptional RPVOT oxidative stability, especially when used in base fluids with high oleic, high saturate and low polyunsaturate content such as very high oleic algal oils, modified castor oils and OSPs.

Typical Properties		
	HF-546	HF-580
Appearance	Hazy Light Green Liquid	Clear Amber Liquid
Odor	Mild	Mild
Specific Gravity	0.92	0.98
Lbs per Gallon	7.7	8.2
Flash Point	>150°C (300°F)	> 230°C (450°F)
Kinematic Viscosity	80.0 cSt at 100°C 684 cSt at 40°C	— 50 cSt at 40°C
Treatment Level (by weight)	4.4%	2.5%

The service life of the hydraulic fluid is limited by the stability of the vegetable oil; a maximum temperature of 70°C (160°F) is recommended. Heating before blending is not required.

Saw Guide Oil Additive Package

FUNCTIONAL SGP-567 is designed for formulating saw guide oils in either biobased or conventional base stock formulations. **FUNCTIONAL SGP-567** is a robust, non-hazardous, multifunctional additive that provides antiwear, mild EP, rust protection and enhanced lubricity. **FUNCTIONAL SGP-567** is recommended for multi-blade, gang saws and trimmers commonly used in lumber production.

FUNCTIONAL SGP-567 should be used at 1.5% by weight in vegetable oil. The addition of a thickener, **FUNCTIONAL V-515**, will increase the viscosity to the higher ISO grades required for this application. **FUNCTIONAL V-584** may also be added to increase adherence of the oil to the saw guides and blades. For continuous saw operation in climates below -20°C, a pour point depressant such as **FUNCTIONAL PD-555C** is recommended for biobased formulations.

Open Gear Oil Additive Package

FUNCTIONAL GA-502 is an EP additive designed for use in biobased open gear lubricants. **FUNCTIONAL GA-502** contains antiwear additives, demulsifiers, a pour point depressant and a tackifier. Fluids containing **FUNCTIONAL GA-502** are suitable for use in environmentally sensitive areas. The typical treat level is 2–3% in a suitable base stock.

Multifunctional Rock Drill Package

FUNCTIONAL RD-535 is a high performance oil additive package having EP/antiwear, corrosion inhibition and tackiness properties especially suited for rock drilling applications. **FUNCTIONAL RD-535** is readily biodegradable when formulated with vegetable base stocks and is designed to meet the requirements of pneumatic tools, down-hole and surface drilling equipment. It is formulated with a tackifier to allow the lubricant to adhere to tooling surfaces, further reducing corrosion and wear in the presence of compressed air. It is designed to emulsify water in wet conditions. The wear reduction performance greatly reduces the incidence of premature bit shanking and reduces operating costs.

FUNCTIONAL RD-535 is a proprietary formulation recommended for vegetable oil base stocks. **FUNCTIONAL RD-535** is soluble in oil, insoluble in water, and contains 20% sulfur and 0.9% phosphorous by weight. See the Technical Data Sheet for additional information. The recommended initial treat level is 5% **FUNCTIONAL RD-535**

by weight. The optimum level is dependent on the severity of the application. At 5% by weight in canola oil, the viscosity is 8.6 cSt at 100°C, 33.8 cSt at 40°C and the VI is 249. **FUNCTIONAL RD-535CP** is a similar product that demulsifies water.

FUNCTIONAL RD-535 may be a skin and eye irritant, and should be handled with suitable personal protection. The maximum heating temperature is 140°F. At higher temperatures, **FUNCTIONAL RD-535** may be a respiratory irritant.

Finished ISO 220 Rock Drill Oil Performance		
Formula	Typical Properties	
(by weight in high oleic canola oil)	Flash Point (COC)	>150°C
FUNCTIONAL RD-535 5%	Kinematic Viscosity at 100°C (ASTM D445)	36 cSt
FUNCTIONAL V-508F	Kinematic Viscosity at 40°C (ASTM D445)	224 cSt
For ISO 220 15%	Viscosity Index	211
For ISO 320 18%	Performance	
For ISO 460 20%	4-Ball EP Test (ASTM D1783), weld load	250 kg
	Timken Load Test (ASTM D1782), failure point	>70 lbs. (31 kg)
	Emulsion Stability (ASTM D1401)	1/6/73 (30 min)

Biodegradable Two-Cycle Engine Oil

FUNCTIONAL TWO-CYCLE ENGINE OIL is inherently biodegradable and compatible with gasolines containing 10wt% ethanol. This product meets JASO-FD specifications. **FUNCTIONAL TWO-CYCLE ENGINE OIL** outperformed synthetic oil in testing. 50:1 dilution is recommended.

Functional Two-Cycle Engine Oil	
Typical Properties	
Flash Point	105°C (221°F)
Kinematic Viscosity	7.3 cSt at 100°C
Biodegradability	54% (OECD 301B)
Performance	
Piston Merit Rating (50:1 dilution)	
Functional Two-Cycle Engine Oil	4.80
Synthetic Reference Oil	4.45

Anti-oxidant for Biobased Lubricants

Vegetable oils generally have poor oxidative stability that may contribute to oil failure due to the rapid increase in viscosity, and sludge and deposit contamination. BHT or TBHQ may be used as an economic anti-oxidant for vegetable oils at treat rates as low as 0.15% by weight.

For premium performance, **FUNCTIONAL AO-550** is recommended. **AO-550** is a proprietary mixture of oxidation inhibitors, anti-wear agents and rust inhibitors designed to give optimum performance in ashless bar and chain oils, hydraulic fluids, industrial gear oils or whenever enhanced oxidative stability is required of a vegetable or mineral oil.

AO-550 Performance in Canola Oil		
	Untreated Canola Oil	With 1% AO-550
RPVOT	36 minutes	195 minutes
AOCs Cd 12b	4 hours	590 hours

Purchasing Information

Headquarters

FUNCTIONAL PRODUCTS INC.

8282 Bavaria Road
Macedonia, OH 44056
Phone: 330-963-3060
Fax: 330-963-3322
sales@functionalproducts.com
sds@functionalproducts.com
www.functionalproducts.com

North America

United States

Midwest

(MO, KS, OK, AR, NM, NE, IA, IL, CO, TX)

Hall Technologies

6300 Bartmer Industrial Drive
St. Louis, MO 63130
Phone: 314-725-2600
Fax: 314-862-7377
www.halltechinc.com

East Coast

(CT, DE, Eastern PA, Eastern NY, NH, NJ, MA, MD, ME, RI, VT)

Ivanhoe Industries, INC.

818 William Leigh Drive
Building H
Tullytown, PA 19007
Phone: 215-547-1200
Fax: 215-946-7411
j.snyder@ivanhoeindustries.com

Southeast

(VA, NC, SC, GA, AL, MS, LA, FL)

Lintech International

PO Box 10225
Macon, GA 31297
Phone: 877-546-8324
Fax: 478-784-1745
www.2lintech.com

West Coast

(AK, AZ, CA, ID, HI, MT, NV, OR, UT, WA, WY)

Tri-iso Tryline, LLC

2187 Newcastle Ave. #101
Cardiff By The Sea, CA 92007
Phone: 909-626-4855
Fax: 909-621-9119
www.tri-iso.com

Canada

L.V. Lomas

99 Summerlea Rd.
Brampton, Ontario
L6T 4V2, Canada
Phone: 1-800-575-3382
Fax: 905-458-0722
www.lvloomas.com

Mexico

Proaindsa

Toledo 37, Col Alamos
CP 03400 Mexico City DF, Mexico
Phone: 011-52-555-696-5551
Fax: 011-52-555-696-5420
www.proaindsa.com

Australia

A. S. Harrison & Co, Pty Ltd.

75 Old Pittwater Road
Brookvale
NSW, 2100, Australia
Phone: +61 2 8978 1000
www.asharrison.com.au

Europe

France, Germany

Lumar France

6 Avenue Eiffel
78420 Carrières sur Seine
Phone: +33 (0)1 80 83 50 40
Fax: +33 (0)1 30 15 03 13
contact@lumarfrance.com
www.lumarfrance.com

Lumar Deutschland

Hirschstraße 26
70173 Stuttgart
Phone: +49 (0)711-18-56-27-13
Fax: +49 (0)711-664-98-40
info@lumardeutschland.com
www.lumardeutschland.com

Italy

Lumar Italy

Str. Com. le per Campagna, 5
20078 San Colombano al Lambro
Milano
Phone: +39 0371 200463
Fax: +39 0371 200445
italia@lumarquimica.com
www.lumarquimica.com

Spain, Turkey

Lumar Quimica, S.L.U.

Milanesat, 25-27, 4t. 1a.
08017 Barcelona
Phone: +34 93 594 75 00
Fax: +34 93 594 75 01
lumar@lumarquimica.com
www.lumarquimica.com

Switzerland

Interferm AG

Industriestrasse 19
CH-6260 Reiden, Switzerland
Phone: +41 41 725 35 10
Fax: +41 41 725 36 19

United Kingdom

Terry Dicken

Unit 13, Sandwell
Business Development Centre
Oldbury Road, Smethwick B66 1NN
Phone: 44-121-544-3638
terrydicken@hotmail.com

Asia

India, Bangladesh

Environ Speciality Chemicals Pvt. Ltd.

A-305 Kemp Plaza
Chincholi Bunder Road
Malad (West)
Mumbai 400064
Phone: 91-22-4003-9230/31/32
Fax: 91-22-4003-9240
sales@envirochem.com
www.envirochem.com

Asia

China

Smart Oil & Chemical Limited

Flat F, 23/F, Block 10, Lok Shun Path
Royal Ascot, Shatin
NT, Hong Kong
Phone: 852-2887-5466
Fax: 852-2636-6562
brianay@smart-oil.com

Greebase Industries, Inc.

Room. 516, No. 3966
South Hongmei Road
Shanghai
Phone: 86-186-2158-0862
Fax: 86-21-5075-0863

Japan

Nippon Chemicals Sales Co., Ltd.

1-1-1 Ebisu-Minami
Shibuya-ku Tokyo, 150-0022
Phone: 03-3719-0366
terui@ncstokyo.co.jp
info@ncstokyo.co.jp

Thailand

Connell Brothers Company Ltd.

B.B. Building, 18th Floor, Unit 1802,
No. 54 Sukhumvit 21 Road (Asoke)
Klongtoey-Nuea, Wattana
Bangkok 10110
Phone: 66-0-2259-8500
Fax: 66-0-2640-8192
Cell: 66-8-1755-1021
Wut.C@wecocbc.com
www.connellbrothers.com

Korea

Inwoo Corp.

2F Weedang Building
50-8 Bangjee-Dong
Songa Gu, Seoul 138-050
Phone: 82-2-2202-7028
Fax: 82-2-2202-7029
www.inwoocorp.com.kr

Singapore

Eweka International Pte. Ltd.

62 Ubi Road 1
#06-22 Oxley Bizhub 2
Singapore 408734
Phone: 65-6348-7279
Fax: 65-6444-2469
rianto@ewekainternational.com.sg

Taiwan, ROC

Shiony Chemical Co. Ltd.

12F-8, No. 70, Sec. 2
Roosevelt Road
Taipei 100
Phone: 886-2-2356-0258
Fax: 886-2-2396-8928
shiony@ms31.hinet.net
shiony.taipei@msa.hinet.net

United Arab Emirates

Environ Specialty Chemicals Gulf FZE

Office #310, Business Center 6
Al Mareed Building
RAK Free Trade Zone
P.O. Box 56302, Ras Al Khaimah
UAE
Phone: +91-22-4248-9216
ravi@environchemfze.com
www.environchemfze.com