LIFE CYCLE ASSESSMENT

MILLER
A HUBER COMPANY

PRODUCT

Nu-Film® P

DESCRIPTION

Nu-Film® P adjuvant is a superior deposition, spreader, and sticker adjuvant with non-ionic properties based on proprietary Miller technology containing Pinolene® terpene polymer. Once applied, Nu-Film P begins to polymerize on the leaf surface forming a soft elastic film. This film reduces the effects of rainfall erosion, volatility, and ultraviolet (UV) degradation on agrochemical spray deposits.

BENEFIT
SOFT ELASTIC FILM FORMATION OVER 7-10 DAYS

BENEFIT
REDUCTION IN VOLATILIZATION

BENEFIT
IMPROVES CONTACT, WETTING, AND ADHESION OF AGROCHEMICALS ONTO PLANT SURFACE

BENEFIT
MAXIMIZES THE EFFECTIVE LIFE OF AN AGROCHEMICAL AFTER APPLICATION

BENEFIT
SHIFT FROM HIGH DOSE APPLICATION TO LOW DOSE

BENEFIT
ORGANIC COMPLIANT

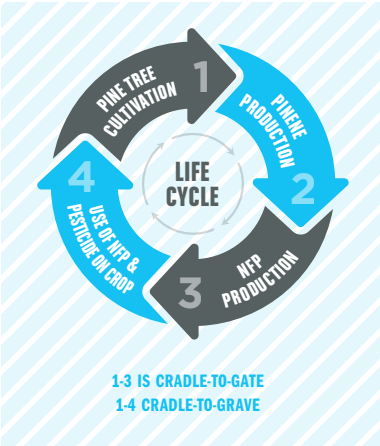
OUR COMMITMENT TO SUSTAINABILITY

One of J.M. Huber Corporation's (Huber's) top priorities is being a responsible neighbor and steward of the environment. Our actions are guided by the Huber Principles and help us deliver on our commitment to long-term, sustainable business performance. As part of Huber Engineered Material's commitment to sustainable product development, we conducted a Life Cycle Assessment (LCA) to provide transparency to our customers and to better understand and improve product performance.

WHAT IS A LIFE CYCLE ASSESSMENT?

Life cycle assessment (LCA) is an analytical tool used to comprehensively quantify and interpret the environmental impacts of the entire life cycle of a product or system from raw material extraction to the gate of the manufacturing site (cradle-to-gate) or to disposal of the product (cradle-to-grave).

Miller purchases pinene and further blends and mixes additional raw materials to yield the Nu-Film P product. Nu-Film P is then sold to farmers who mix Nu-Film P with the pesticide of their choice to be applied to a crop. As shown in the figure to the right, impacts measuring the raw material phase up to the production and packaging of Nu-Film P is considered the cradle-to-gate impacts of this study. The cradle-to-grave impacts include the Nu-Film P cradle-to-gate impacts as well as impacts associated with transportation to final customer and of the use of the product.



LIFE CYCLE STUDY INFORMATION

A cradle-to-grave life cycle assessment was conducted and went under an independent third-party critical review to demonstrate the study was done in accordance with ISO 14040/14044. The period of data used for the study was 2021 data. The functional unit utilized for the study is the applied amount of product for the coverage of one acre of land. The declared unit is one gallon of product. The LCA Software utilized was SimaPro v9.1.1 using the CML 2000 methodology. Contact HEM.Sustainability@huber.com for any questions related to this fact sheet.

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LIFE CYCLE IMPACTS

The tables below include the cradle-to-grave impacts of Nu-Film P with the different pesticides selected for the scope of this study. As tank mixes and applications vary depending on type of crop, geography, weather conditions, and many other factors, a low and high use rate was assumed for each pesticide. Due to the complexity of use rates, it is essential for the user to always read and follow the label.

TABLE 1:

CRADLE-TO-GATE IMPACTS OF ONE GALLON

*Denotes that the number is greater than zero but less than 4 decimals (i.e., 0.00001)

IMPACT CATEGORY	UNIT	CRADLE-TO-GATE
Global warming (GWP100a)	kg C02 eq	10.1097
Abiotic depletion	kg Sb eq	>0*
Abiotic depletion (fossil fuels)	MJ	160.5598
Photochemical oxidation	kg C2H4 eq	0.0033
Acidification	kg S02 eq	0.0538
Eutrophication	kg P04--- eq	0.0482
Ozone layer depletion (ODP)	kg CFC-11 eq	>0

TABLE 2:

CRADLE-TO-GRAVE IMPACTS WITH LOW USE RATE OF DIFFERENT PESTICIDES (PER ACRE)

Note I: The following low use rates were assumed; 0.27 kg/acre of chlorothalonil, 0.47 kg/acre of dichlorophenol, 0.37 kg/acre of glyphosate, 0.01 kg/acre of pyrethroid, and 1.13 kg/acre of captan.

Note II: An average of 0.22 kg/acre of NFP for each tank mix was assumed.

IMPACT CATEGORY	UNIT	CHLOROTHALONIL	DICHLOROPHENOL	GLYPHOSATE	PYRETHROID	CAPTAN
Global warming (GWP100a)	kg C02 eq	1.7873	2.5475	4.8197	0.8799	5.1743
Abiotic depletion	kg Sb eq	>0	>0	>0	>0	>0
Abiotic depletion (fossil fuels)	MJ	28.0190	43.6173	67.2087	13.7719	88.4555
Photochemical oxidation	kg C2H4 eq	0.0007	0.0011	0.0021	0.0003	0.0016
Acidification	kg S02 eq	0.0084	0.0117	0.0223	0.0048	0.0253
Eutrophication	kg P04--- eq	0.0050	0.0062	0.0233	0.0035	0.0093
Ozone layer depletion (ODP)	kg CFC-11 eq	>0	>0	>0	>0	>0

TABLE 3:

CRADLE-TO-GRAVE IMPACTS OF WITH HIGH USE RATE OF DIFFERENT PESTICIDES (PER ACRE)

Note I: The following high use rates were assumed; 2.04 kg/acre of chlorothalonil, 1.88 kg/acre of dichlorophenol, 3.53 kg/acre of glyphosate, 0.02 kg/acre of pyrethroid, and 2.27 kg/acre of captan.

Note II: An average of 0.22 kg/acre of NFP for each tank mix was assumed.

IMPACT CATEGORY	UNIT	CHLOROTHALONIL	DICHLOROPHENOL	GLYPHOSATE	PYRETHROID	CAPTAN
Global warming (GWP100a)	kg C02 eq	8.8111	8.0416	39.8668	1.0437	9.6718
Abiotic depletion	kg Sb eq	0.0001	0.0001	0.0005	0.0001	0.0001
Abiotic depletion (fossil fuels)	MJ	137.0609	140.2946	543.9367	16.1547	166.2038
Photochemical oxidation	kg C2H4 eq	0.0038	0.0035	0.0184	0.0004	0.0030
Acidification	kg S02 eq	0.0368	0.0344	0.1777	0.0055	0.0467
Eutrophication	kg P04--- eq	0.0159	0.0148	0.1942	0.0037	0.0153
Ozone layer depletion (ODP)	kg CFC-11 eq	>0	>0	>0	>0	>0

The following products are not included in the scope of this LCA however are assumed to have similar cradle-to-gate environmental footprints due to similar raw materials, process, and energy use: Nu-Film® 17 Adjuvant, Sustain® Adjuvant, Vapor Gard® Crop Production Aid, Pod Ceal® Crop Production Aid, and Spur Shield® Crop Production Aid. All mentioned products are Pinolene® terpene polymer based products and use rates may vary.