

Novel and Green surfactants for water soluble film and Home and Personal care



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INDIA GLYCOLS LTD



INDIA GLYCOLS LIMITED

A perfect example of a “**MAKE IN INDIA**” company. A Company with a difference, thanks to their

- A. Vision
- B. Innovation
- C. Green- Technology
- D. Sustainability-Oriented Approach.

Production Capacity

Total – 525,000 MTPA

Glycols -175,000 MTPA; Glycol Ethers -75,000 MTPA;

Ethoxylate-100,000 MTPA

Gases -80,000 MTPA; ENA -60,000 MTPA;

Guar Gum –35,000 MTPA Ennature – 1,300 MTPA

First and the only company in the world to manufacture completely green Ethylene Oxide (a valuable chemical) from Molasses (Sugar industry waste); A novel Idea!

First and the only company in the world to manufacture Green MEG from Molasses, used for manufacturing of a large number of chemicals / products including packaging.

First and the only company in the world to manufacture Green Surfactants starting from Molasses; Unique facility!

First and the only company in the world to export Green MEG, for packaging to The Coca-Cola Company, one of the leading manufacturers of beverages.

First and the only company in the world to export Green Surfactants for specialty applications

Certifications:

- ISO-9001-2008 ; ISO 14001-2004
- ISO 50001:2011 ; ISO 22000:2005
- OHSAS 18001:2007 (OHSMS)
- SA 8000: 2008 (Social Accountability)
- FSSC 22000 (*Carbondioxide; Gaur Gum*)
- HALAL : for Guar-Gum & Sorbox 80
- KOSHE Certification for Guar-Gum
- REACH : for Bio Ethylene oxide
- GOTS : surfactants for Textile

Water Soluble film : Packaging

- ❑ PVA film has good water solubility and it can dissolve at different temperatures with different dissolving pace.
- ❑ PVA film has been widely used in the packaging of fertilizers, pesticide, dyestuffs, detergent, water-sewer additives, mineral additives, cement additives etc.
- ❑ Problem of disposal of packaging is completely eliminated.
- ❑ Water soluble film is completely Bi-degradable.
- ❑ Highly reactive chemicals can also be packed.



WSF film PODS -Liquid



Embossed Toilet block -PVA

What is Water Soluble Film (WSF) ?



What it is?

- Water Soluble Film : It is PVA/PVOH
- Packaging material is environmentally safe & fully biodegradable when disposed in water or waste

Properties

- Optimum Tensile Strength
- Flexibility for using in multiple forms of packaging
- Excellent Moisture/Heat Sealing
- Eco-friendly

Applications

- ❖ Industries like Agrochemical,
- ❖ Health & Hygiene,
- ❖ Dyes
- ❖ Cément,
- ❖ Enzymes etc.

Advantages of Water Soluble Film

Eco Friendly

- Dissolves without leaving any harmful residue and
- Avoid the use of regular plastic bags (non-water-soluble packaging), which generate large amount of chemical residues.

Safe

- Avoids contact with the toxic product / Cross Contamination

Easy to Dose/ Handle

- Increase dosage accuracy by simplifying the process and avoid the wastage in packaging
- Avoid breakage of liquid pesticide / chemical / detergent bottles packaging, effectively reduce the transport costs of bottle weight and efficiently solve the risks of leakage and the problems of recycling and environmental pollution.

Convenient

Doses has less storage space and easy to handle

Usages

Used in varied Industries in multiple application as packaging

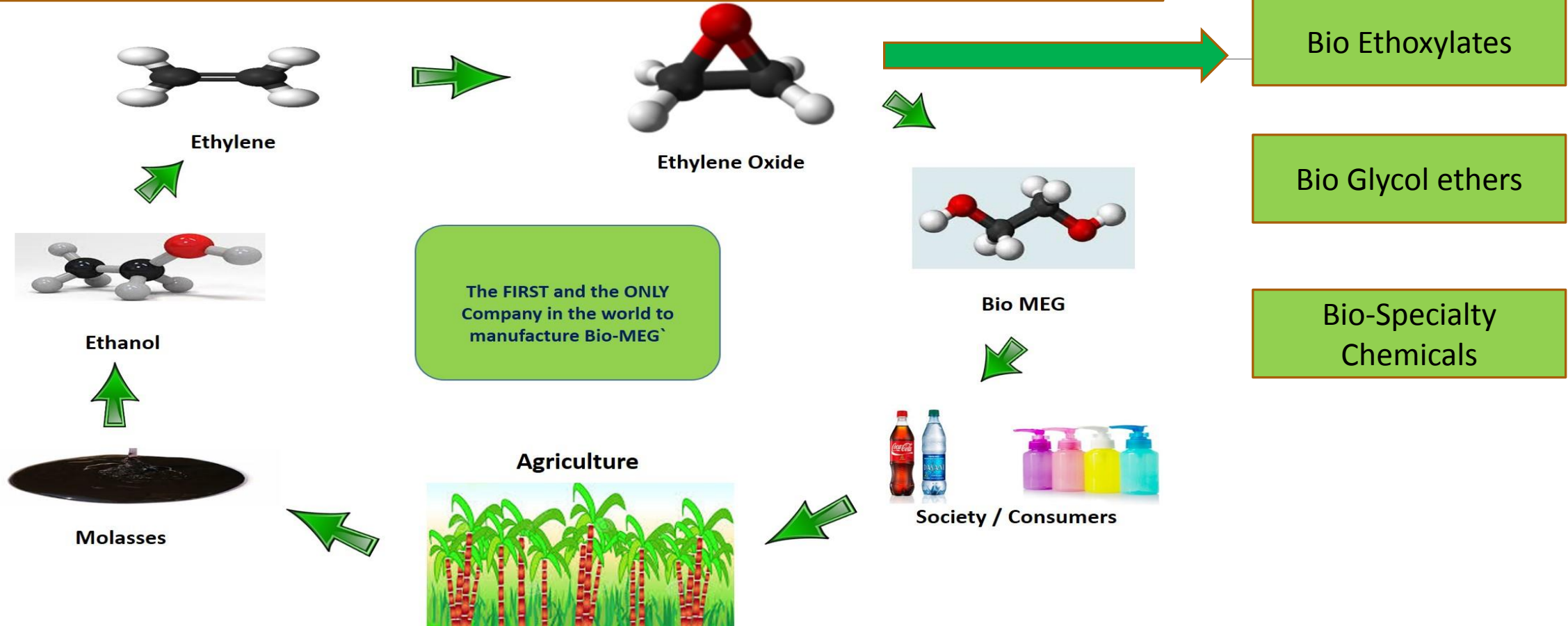




IGL's : Green Surfactants for WSF & HPC

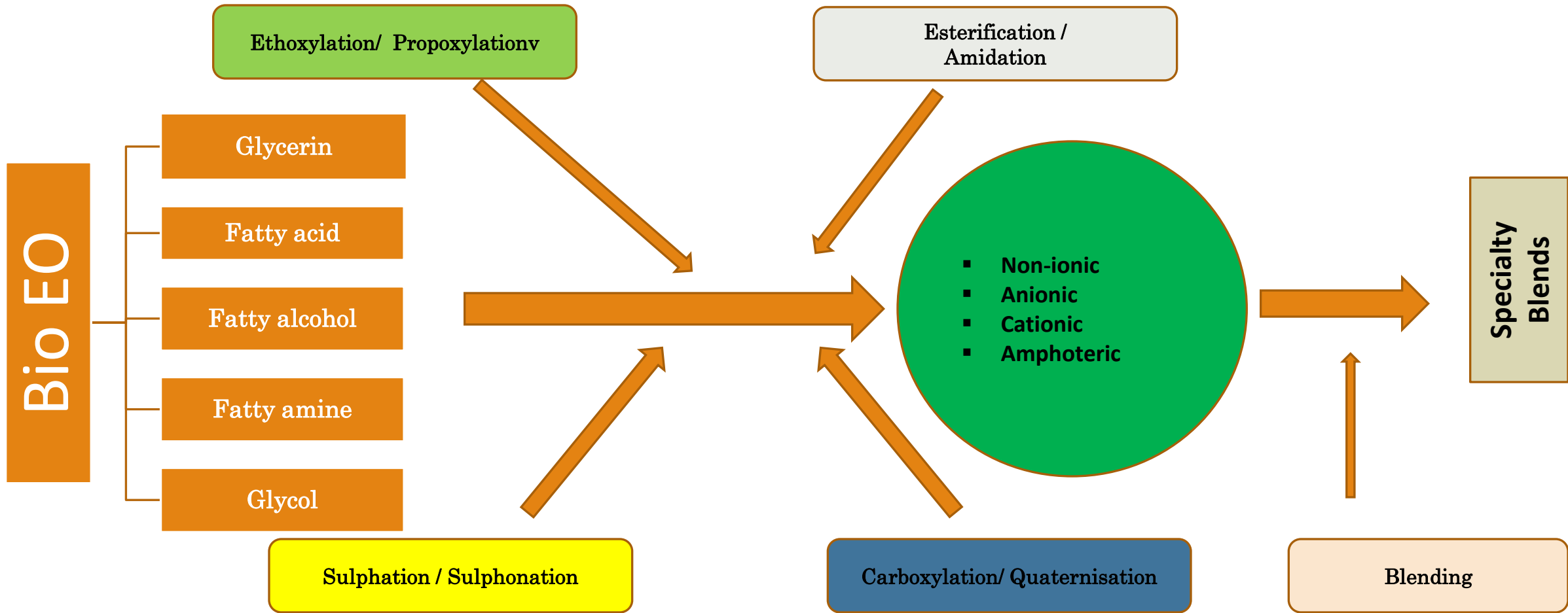
Perfect Example : Sustainability

MOLASSES–Bio/Green MEG and Bio surfactants /Specialty Chemicals



➔ IGL is the role model of Green and Sustainable Chemicals Industry.

IGL : Green Surfactants



Water soluble film : Key criteria

- ❑ Stability during shelf-life of the product packed in it.
- ❑ Complete dissolution when subjected to its use in a given application
- ❑ Polymer- surfactant synergy to achieve improved performance of detergents
- ✓ For all the above desired criteria of performance of the water soluble films, specially designed surfactant molecules would be required.
- ✓ Film manufacturers will have to work in close co-ordination with surfactant manufacturers

Water soluble film : Ingredients

Components	Description
Polymer	PVA/PVOH
Plasticizers	PEG, DEG, TEG, Glycerin Ethoxylate; TMP Ethoxylates, Phosphate ester etc
Antifoam	Alkyl Phenol Ethoxylate; Fatty alcohol Ethoxylate; EO-PO Block co-Polymer.
Biocides	Quaternary ammonium salts; Benzalkonium compounds; Dialkyl dimethyl ammonium chloride etc.
Surfactant	Carboxylate; Oley Cetyl sulphate; Phosphate ester; Lauryl alcohol ethoxylate; Alkyl Phenol ethoxylates; EO-PO Block co polymer; Oleyl cetyl Ethoxylate; fatty acid ester ; Amides;
Fillers/Extenders	Starch; silica; metal oxides; calcium carbonate; talc, mica

Process aid :Plasticizers

- ❖ WSF need to have such high strength or toughness so that they can used in hot, humid regions or cold region.
- ❖ In particular, impact resistance at low temperature is required of WSF.
- ❖ Need to be used plasticizers for the purpose of decreasing the glass –transition point of film.
- ❖ Thus, improving the impact resistance of the film at low temperature.
- ❖ Addition of plasticizers in WSF not only above purpose but also increasing the water solubility.

Types of Plasticizers :

Di & Tri ethylene Glycols; Poly ethers as Polyethylene Glycol (preferably PEG 400); Glycerin ethoxylate. Pentaerythritol Ethoxylate; TMP Ethoxylate; polyoxyalkylene ether phosphate amine salt.

Dosage : It can be use 10 to 30%

 **IGL have green and bio Polyethylene Glycols and other Ethoxylates.**

Process aid : Surfactants

- ❖ Surfactant provide smooth processability of WSF,
- ❖ Ease of separation of the formed film from the metal surface of drum.
- ❖ Act as Anti-blocking agent

- ❖ **Type of Surfactants:**
 - Anionic and Non-ionic can be used.
 - **Anionic surfactants:** Carboxylate; Oleyl Cetyl sulphate; Phosphate ester
 - **Nonionic Surfactants:** Lauryl alcohol ethoxylate; Alkyl Phenol ethoxylates; EO-PO Block co polymer; Oleyl Cetyl Ethoxylate; fatty acid ester ; Amides;
 - **Dosages:** Surfactants can be used alone or in combination preferably 0.2 to 2% of based mass of PVA.(More than 2 %, surfactant leaches out of the surface of the film and acts to cause blocking which lead to deterioration in handling properties of the film.

 **IGL have complete range of Anionic and Non-ionic surfactants based on green chemistry**

Process aid

❑ Anti-Foaming agents:

- ❖ To prevent foaming with possible occlusion of air bubbles in the cast film.
- ❖ Anti-foaming agent to be added in solution before raising the temperature and agitation.
- ❖ It will not effect the water solubility of the film .

Types of Anti-Foaming agents:

Alkyl Phenol Ethoxylate; Fatty alcohol Ethoxylate; EO-PO Block co-Polymer.

Dosages: Preferably 0.1 to 0.5% by wt. based on PVA solids.

❑ Biocides :

Biocide should be non toxic to humans especially for those applications of the water soluble film such as detergents, cleaning agents, or for foodstuffs

Types of Biocides:

Quaternary ammonium salts; Benzalkonium compounds; Dialkyl dimethyl ammonium chloride etc.



IGL have unique range of antifoaming agents.

Novel Surfactants' :

Product	Application
Specialty Ester Ethoxylate	Good foaming properties, temperature resistance, synergy with water soluble packaging film
Poly Ether carboxylates	Good foaming properties, hardness tolerance and temperature resistance, Alkali/acid resistance
Alky sulfate	Good foaming, wetting and emulsifying properties, mild with skin
Alky Ether sulfate	Good foaming, wetting and emulsifying properties,
Sulfosuccinates	Wetting and emulsifying properties; anti re-deposit ion.
Alkyl phosphates Alkyl ether phosphates	High electrolyte and low pH tolerance, used in acidic /alkali resistance
Acyl sarcosides	Good wetting, foaming, and emulsifying properties
Fatty acid isethionates and taurides	Good wetting, foaming, and emulsifying properties.

Novel Surfactants'

Product	Application
Alkoxyated (ethoxylated or propoxylated) fatty alcohols	Emulsifiers, wetting agents , detergents and solubilizers; low foam rinsing ais
Ethylene oxide/propylene oxide-block polymers	Wetting agent, rinsing aid, antifoam
Alkylphenol ethoxylates (alkylphenol polyglycol ethers)	Good Wetting agent and dispersant, Emulsifier
Ethoxylated Oils and Fats	Excellent dispersing agent, Emulsifier
Sorbitan ester and ethoxylated derivatives	Emulsifier, dispersant, and solubilizer for a wide range of applications specially to remove complex oils from fabric, wide range of Home and personal care products
Synthetic alcohol Alkoxyate	High performance detergents with unique properties;
Fatty amine Ethoxylate	Solubilizes; dispersant, Acid thickener; Fabric softener property
Bio-PEG	Excipient for Pharmaceuticals c Cosmetic and personal care, Plasticizers for WSF Cosmetic ; Plasticizers
Bio Glycerin Ethoxylate	Plasticizers for WSF, Home and Personal care application.

IGL Green Surfactants: HPC applications

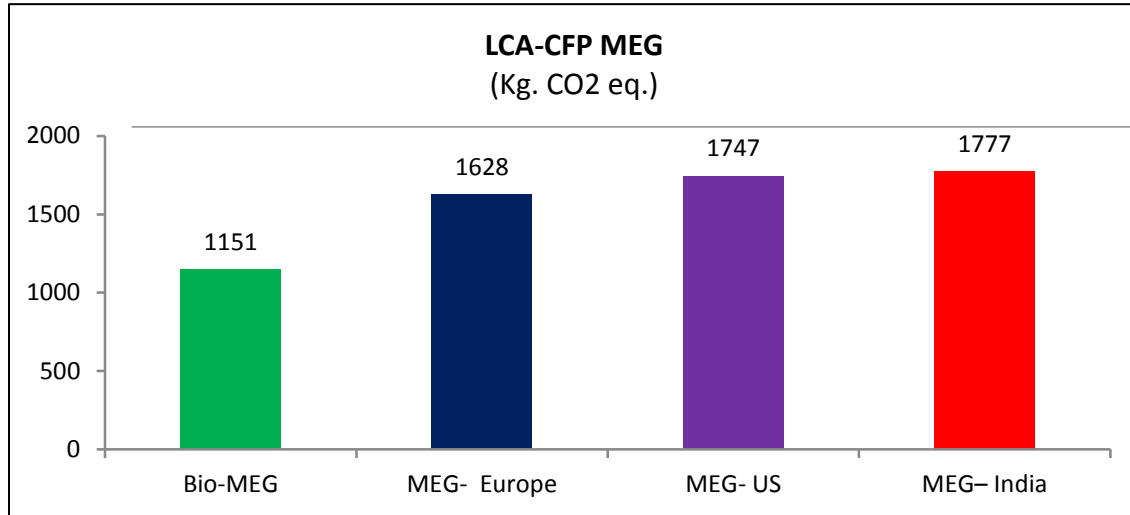
Product Series	Description	Moles range	Application
POLYMEG s	Polyethylene Glycol	MW 200 - 10000	Pharma, Personal Care
	Methoxy PEG	Whole range of Mol. Wt. with varying of EO Moles	Detergent, Pharma
ALPHOXs	Nonyl Phenol Ethoxylate	Whole range of Mol. Wt. with varying of EO Moles	Home care detergent, emulsifier,
	Octyl phenol Ethoxylate	Whole range of Mol. Wt. with varying of EO Moles	
	Card Phenol Ethoxylate	Whole range of Mol. Wt. with varying of EO Moles	
CASTROXs	Hydrogenated Castor oil Ethoxylate	Whole range of Mol. Wt. with varying of EO Moles	Cosmetic and pharma
LARYDETs	Lauryl alcohol Ethoxylate	Whole range of Mol. Wt. with varying of EO Moles	Personal Care ,detergent
	Lauryl Alcohol EO-PO	Special Design for High performance detergents	Home and Personal care, detergent
CETODETs	Cetostearyl Alcohol Ethoxylate	Whole range of Mol. Wt. with varying of EO Moles	Personal Care
	Oleyl cetyl Alcohol Ethoxylate	Whole range of Mol. Wt. with varying of EO Moles	
STEXELs	Stearic Acid Ethoxylate	Whole range of Mol. Wt. with varying of EO Moles	Pharma, Personal Care
	Oleic Acid Ethoxylate	Whole range of Mol. Wt. with varying of EO Moles	
ACRODETs	Synthetic Alcohol Ethoxyalte	Whole range of Mol. Wt. with varying of EO Moles	Home and Personal care, detergent
AMINOXs	Oleyl amine	Whole range of Mol. Wt. with varying of EO Moles	Home care
SORBOXs	Polysorbate 20/80	Whole range of Mol. Wt. with varying of EO Moles	Home and personal care
EPOXELs	EO-PO Co Polymer	Proprietary	Home care

IGL Green Surfactants: HPC application

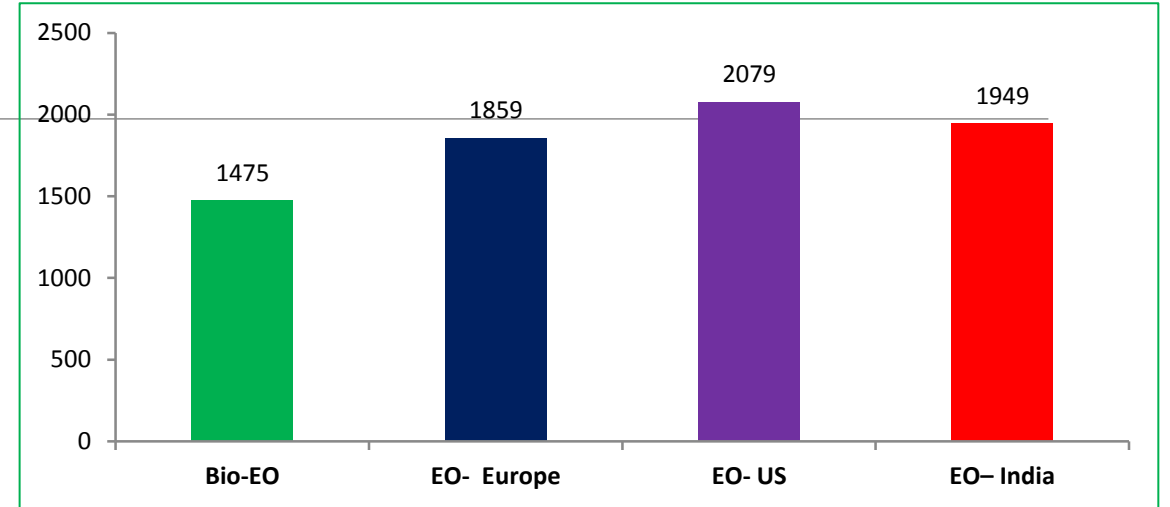


Product Series	Description	Application
IGFOAM	Alkyl Sulphate	Home and personal care, detergent
	Alkyl ether sulphate	Home and personal care, detergent
IGSURF OT	Sulpho-succinate	Home care, detergent, emulsifier,
Betains	CAPB/ CB	Home and personal care, detergent
IGSURF 5950/ 5980	BKC	Home and personal care, detergent
IGVIS	CME/CDEA	Home and personal care,
	EGMS / EGDS	Home and Pers. Care,
	Emulsifying Wax	Pers. Care,
IGSURF (Carboxylate)	Alkyl carboxylate/ Alkyl ether carboxylate	Home and personal care,
IGSURF -Amide	Fatty amides	Home care -Laundry & cleaning, especially wash-up & light duty liquid detergents
IGSURF 5270 PE	Proprietary Formulation	Home care

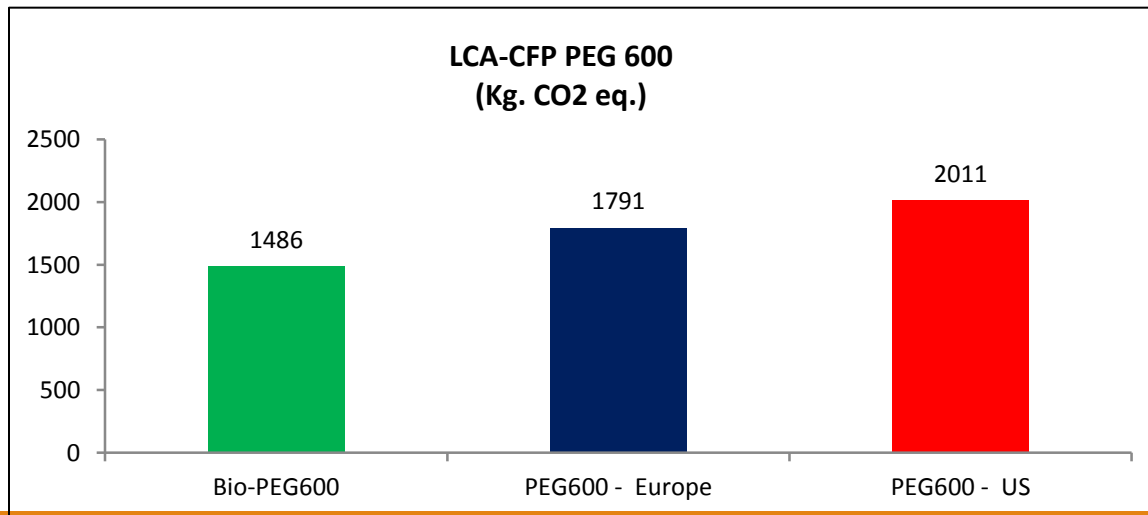
Product LCA :Bio route at IGL v/s conventional route



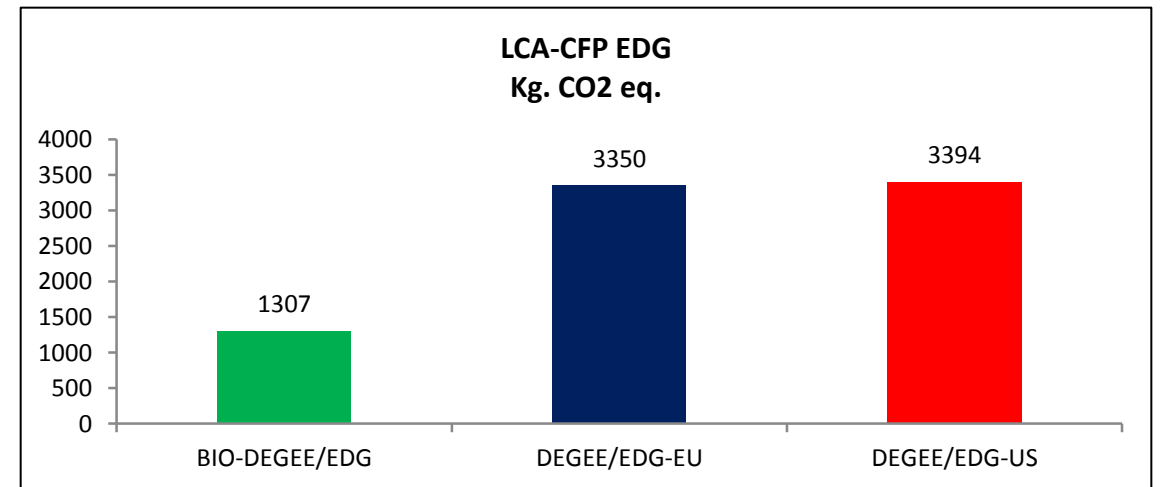
CFP of Bio and Conventional MEG



CFP of Bio and Conventional EO

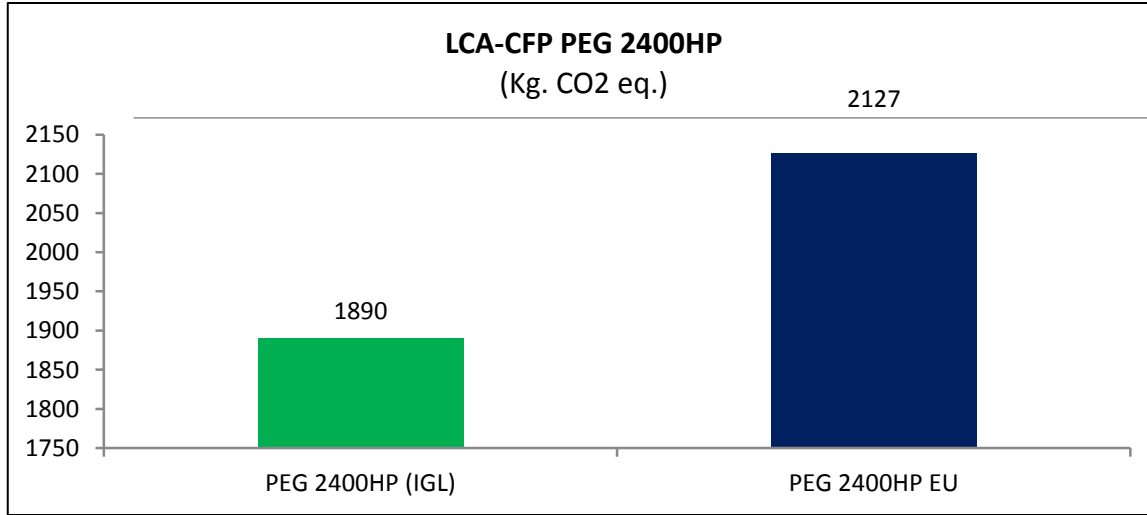


CFP of Bio and Conventional PEG 600

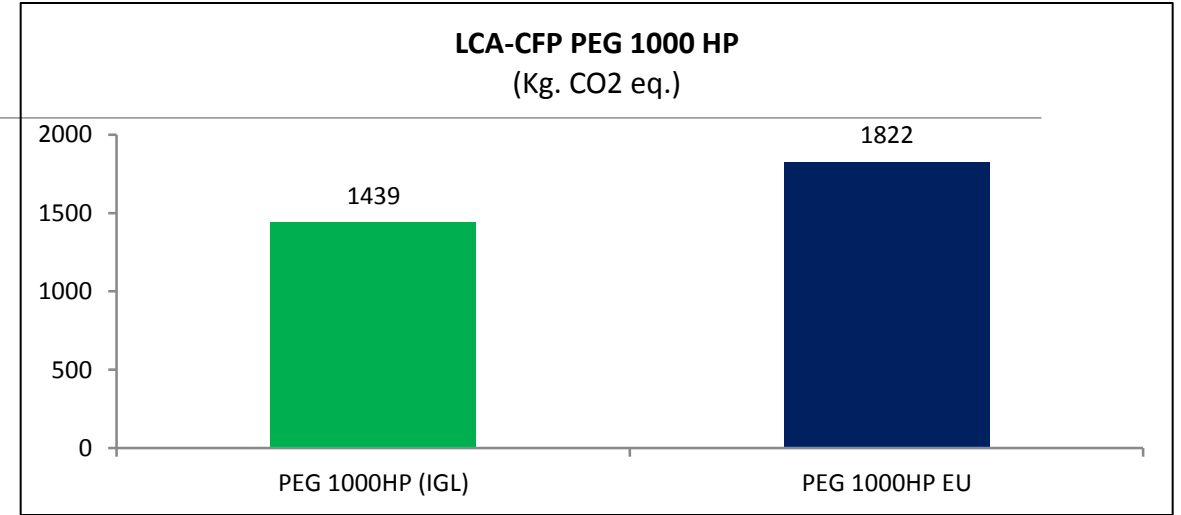


CFP of Bio and Conventional EDG

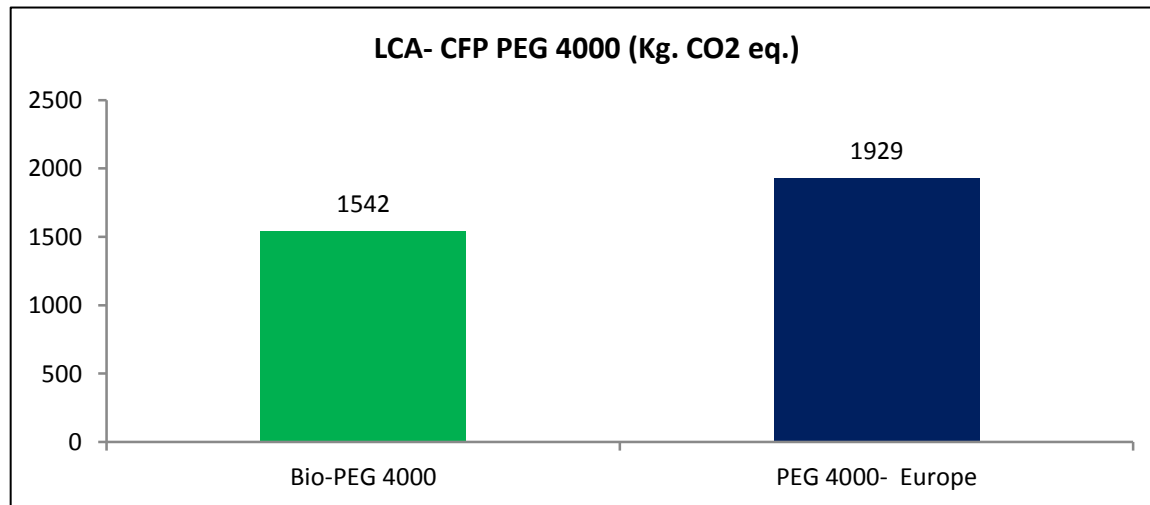
Product LCA :Bio route at IGL v/s conventional route



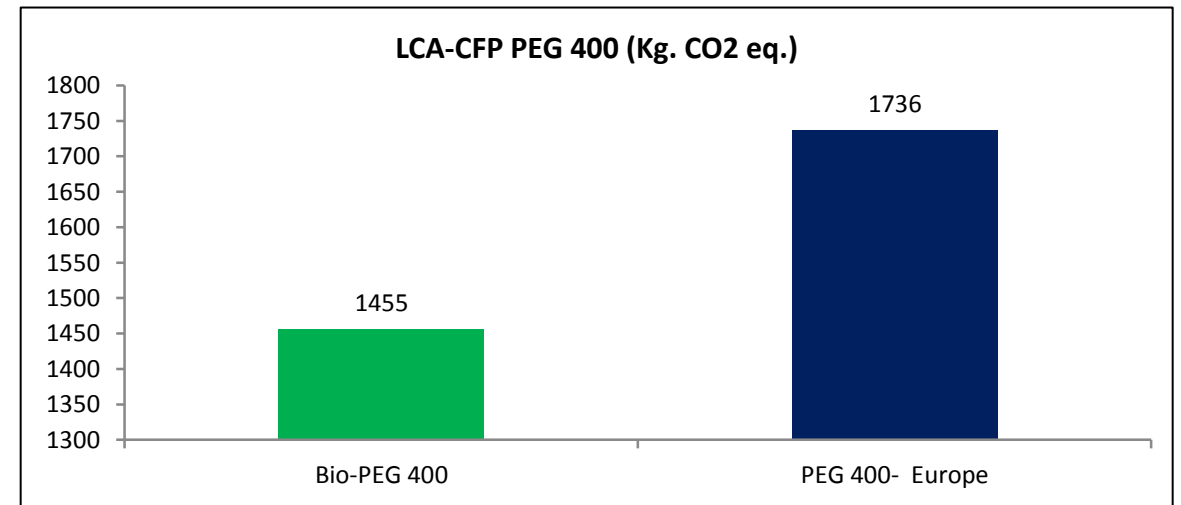
CFP of PEG 2400HP at IGL & EU



CFP of PEG 1000 HP at IGL & EU

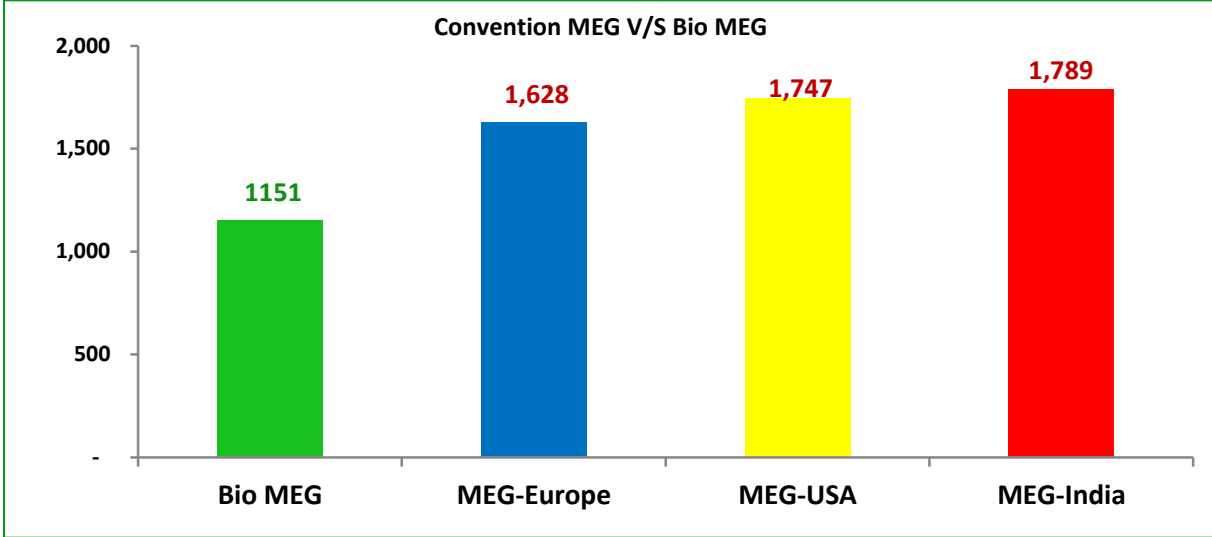
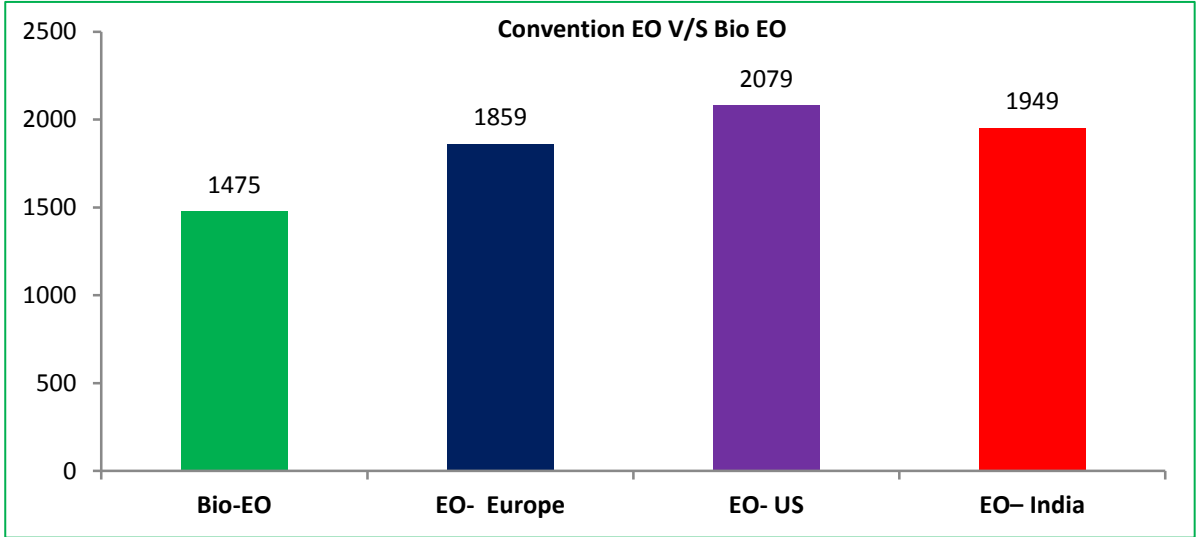
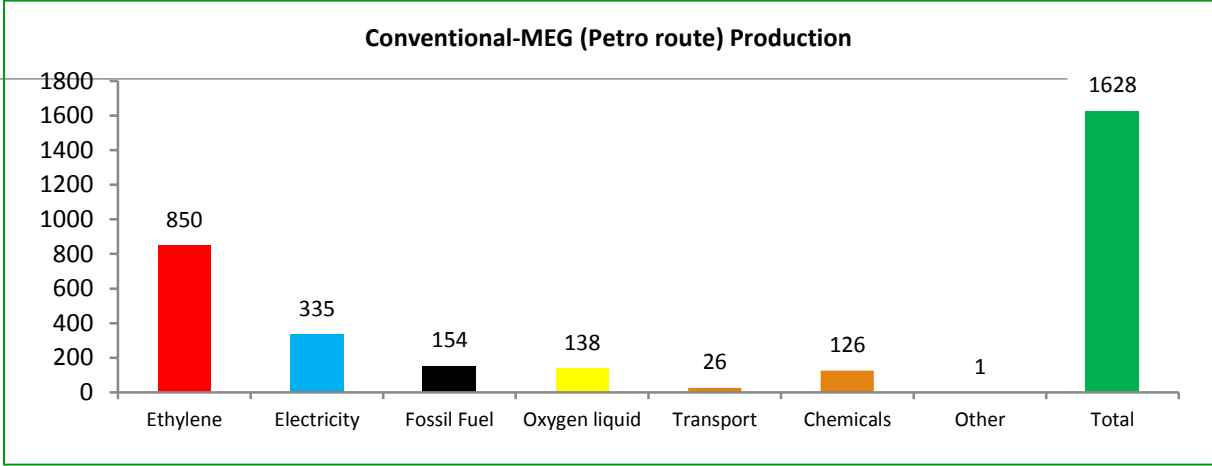
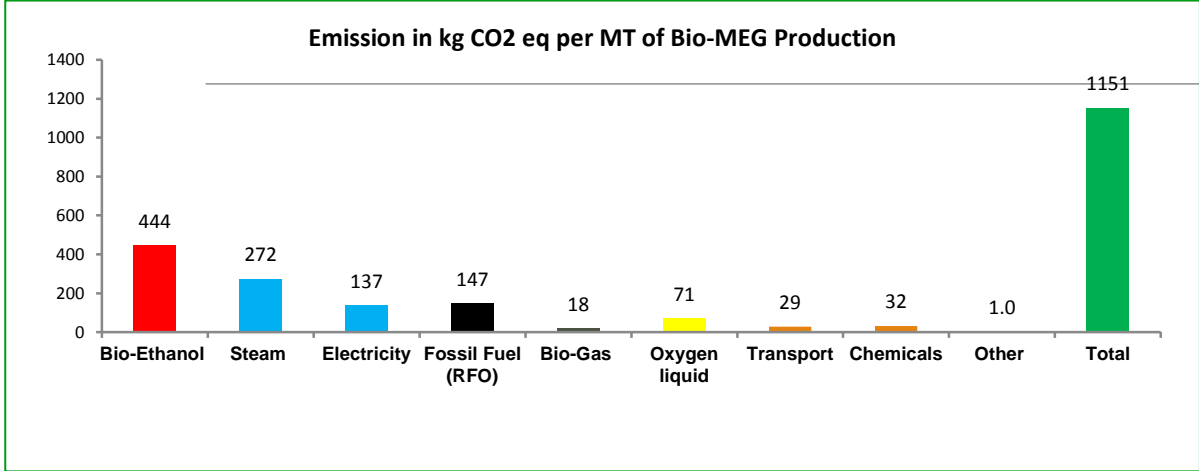


CFP of Bio and Conventional PEG 4000



CFP of Bio and Conventional PEG 400

LCA STUDY - GHG LOAD COMPARISON: BIO-EO/EG V/S CONV. EO/EG



IGL's - R&D CENTRE



Thanks