MATERIAL SOLUTIONS FOR NEW MOBILITY CONCEPTS

TECHNYL®

COMPOUNDED SOLUTIONS TO ADDRESS THE NEEDS OF NEW POWERTRAINS

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DOMO CHEMICALS

A NEW WORLD LEADER IN POLYAMIDES 6 & 66

TOPICS OF TODAY

- DOMO service offer
- Advanced thermal management of e-Mobility components
- High voltage connectors
- Flame retardance in automotive
- High purity compounds
- Circular economy

HUB by TECHNYL® DOMO'S INTEGRATED CONCEPT

LINKING MATERIAL AND INNOVATION

MATERIAL SCIENCE & DATABASE

Advanced mechanical characterization to offer exhaustive and highly predictive material database

DESIGN OPTIMIZATION

Function integration, topological optimization, mold design support

MMi TECHNYL® DESIGN

SIMULATION

Advanced predictive simulation to get numerical validation of a new design

FUNCTIONAL PROTOTYPING

Additive manufacturing of functional prototypes ready to be tested

SINTER LINE® TECHNYL® PROTOTYPING

APT TECHNYL® VALIDATION

APPLICATION PERFORMANCE TESTING

Fast and flexible part testing to homologate designs for a variety of applications

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NEW REQUIREMENTS FOR COOLING CIRCUITS

UP TO 8000H AGEING DATA & STILL HIGH TEMPERATURE

E-Mobility **cooling new challenges:**

Cooling during **DRIVING**
- ICE (PHEV)
- Battery
- Power Electronics

+

Cooling during **CHARGING**
- Battery
- Power Electronics

Total life time requirement

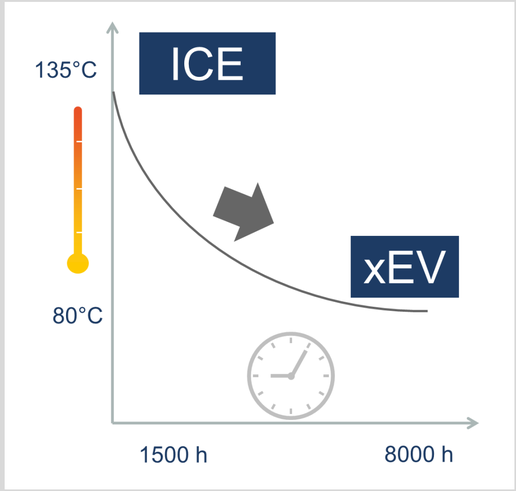
PHEV Water Pump: **12000h**

Ageing profile for same part:

ICE: **2200h / 120°C**

or

E-Car: **5700h / 75°C** + **500h / 80°C**



ICE: historical requirement

OEM	Time *(h)*	Temperature *(°C)*
	1500	135
	3000	120

xEV

OEM	Time *(h)*	Temperature *(°C)*
trends	8000	80

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TECHNYL® BLUE TO AVOID HIGH END EXPENSIVE SOLUTIONS

ENLARGING THE SOLUTIONS

BATTERY COOLING

PPS / PPA SUBSTITUTION

C 218 V30 BK 34NG	A 218 V30 BK 34NG	A 218G2 V30 BK 34N	D 218CR V33 Bk	D 219 V50 Bk
PA 6	**PA 6.6**	**PA 6.6**	**PA 6.10**	**PA 6.10**
Solution for **low temperature** cooling needs	**MARKET REFERENCE** for **H**ydrolysis **R**esistance	PA 6.6 solutions: **pushing the limits**	Solutions to **substitute PPA**	**Best performing** solutions of PA familly
Cost effective solution for battery cooling	Best technical economical solution for PA 6.6 HR	Best in class pure PA 6.6 for hydrolysis resistant	Low glycol/water uptake Very good surface aspect	Very low glycol/water uptake Very good surface aspect

PERFORMANCE IN GLYCOL

10 000h / 80°C	3 000h / 120°C	+30% life extension	1 000h / 135°C	> 2 000h / 130°C

KEY BENEFITS VS PPA:

SURFACE ASPECT - SCRAP REDUCTION - COST / DENSITY - ENERGIE

Glass fiber availability:	*Glass fiber availability:*	*Glass fiber availability:*	*Glass fiber availability:*	*Glass fiber availability:*
GF25 / GF30 / GF35 / GF50	*GF30 / GF35*	*GF30 / GF50*	*GF33 / GF50*	*GF50*

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MATERIAL COMPATIBILITY WITH E FLUIDS ALREADY VALIDATED!

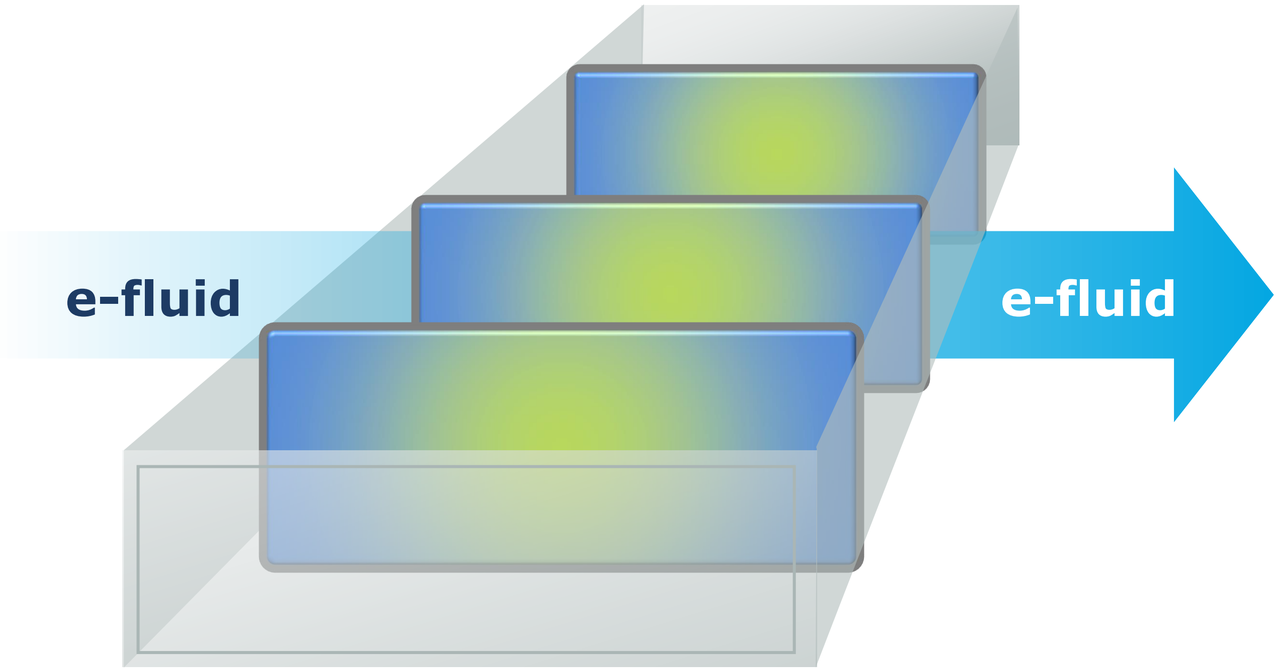
E fluids solution

for future battery cooling enabling

ultra fast charging

Example:

Battery pack Li-Ion cells cooled down by immersion in e-fluids



TECHNYL® ORANGE

for **safe** and **efficient** **HV applications**

- Quick & fair **Go / no-Go** on ability to match color target and specification
- Technical solutions to tackle actual customer pain points

the TECHNYL® ORANGE **toolbox:**

- **Polymers**:
  Technyl PA6, Technyl PA66, Technyl One
- **Flame retardant system**:
  Non FR, Halogenated, Halogen free
  (+20 years of expertise)
- **Pigments**:
  Color stability, migration, mechanical properties, price
- **Laser marking**:
  YAG, Green, UV
- **UL** certified lab and expertise

TECHNYL®

HALOGEN FREE FLAME RETARDANT POLYAMIDES

HFFR PA: PART OF OUR DNA

E&E Flame retardant market is a normed market governed by regulations

RoHS

European Directive

Switch to Halogen free FR solutions

WEEE

European Directive

Trend to eliminate halogen based FR systems

High pressure on **halogenated** FR systems in Europe since beginning of **2000** has created **new opportunities** to develop new flame retardant alternatives

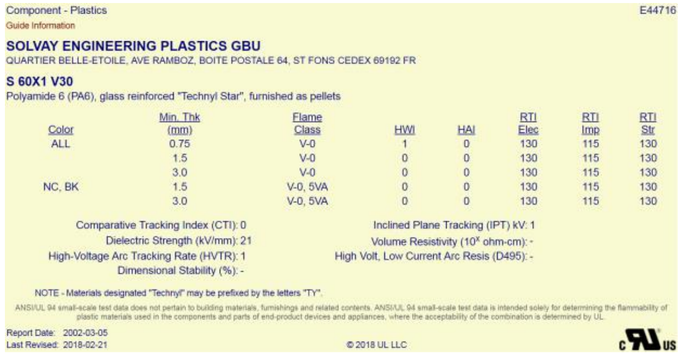
TECHNYL® is a **PIONEER** in developing **H**alogen **F**ree **F**lame **R**etardant solutions (**20 years** of expertise)

TECHNYL®
OUR LABORATORY IS
UL CERTIFIED

In-house UL certified lab in France (Lyon) since **2004**

Creation of ‘Yellow Cards’ according to UL certification and international standards:

- Flammability UL 94
- GW: IEC 60295-2-10 to -13
- HWI: ASTM D 3874
- Dielectric Strength: IEC 60243
- and ASTM D149
- CTI: IEC 60093 and ASTM D 3638-07
- Tensile Strength: ISO 527 and ASTM 638
- Impact: ISO 179
- RTI: UL746B



Component - Plastics E44716

Guide Information

SOLVAY ENGINEERING PLASTICS GBU

QUARTIER BELLE-ETOILE, AVE RAMBOZ, BOITE POSTALE 64, ST FONS CEDEX 69192 FR

S 60X1 V30

Polyamide 6 (PA6), glass reinforced "Technyl Star", furnished as pellets

Color	Min. Thk (mm)	Flame Class	HWI	HAI	RTI Elec	RTI Imp	RTI Str
ALL	0.75	V-0	1	0	130	115	130
	1.5	V-0	0	0	130	115	130
	3.0	V-0	0	0	130	115	130
NC, BK	1.5	V-0, 5VA	0	0	130	115	130
	3.0	V-0, 5VA	0	0	130	115	130

Comparative Tracking Index (CTI): 0
Dielectric Strength (kV/mm): 21
High-Voltage Arc Tracking Rate (HVTR): 1
Dimensional Stability (%): -

Inclined Plane Tracking (IPT) kV: 1
Volume Resistivity (10^x ohm-cm): -
High Volt, Low Current Arc Resis (D495): -

NOTE - Materials designated "Technyl" may be prefixed by the letters "TY".

ANSI/UL 94 small-scale test data does not pertain to building materials, furnishings and related contents. ANSI/UL 94 small-scale test data is intended solely for determining the flammability of plastic materials used in the components and parts of end-product devices and appliances, where the acceptability of the combination is determined by UL.

Report Date: 2002-03-05
Last Revised: 2018-02-21

Fire / smoke certification according to the European norm EN45545-2

(+ France: NF F 16-101 & USA: ASTM E 162 ASTM E 662, ASTM E 1354, SMP 800 C)

Better control of time & more quick reactivity
Close relationship with UL engineers to take advantage from their high expertise

TECHNYL®

HIGHLY PURE MATERIALS

PREVENT CORROSION

Megatrends leading to **increased corrosion risks:**

- **Miniaturisation**
  Thinner walls,
  more serious corrosion consequences

- **Electrification**
  More and safer electrified functions and electronic devices
  High voltage @ 350V to 900V

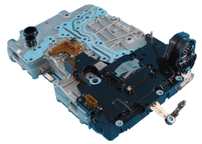
- A deterioration to **PART FAILURE**

Sensor

Radar

Camera

ECU Electrical Control Unit



Transmission control unit

- Short circuit leading to **FIRE**

Window opening motor

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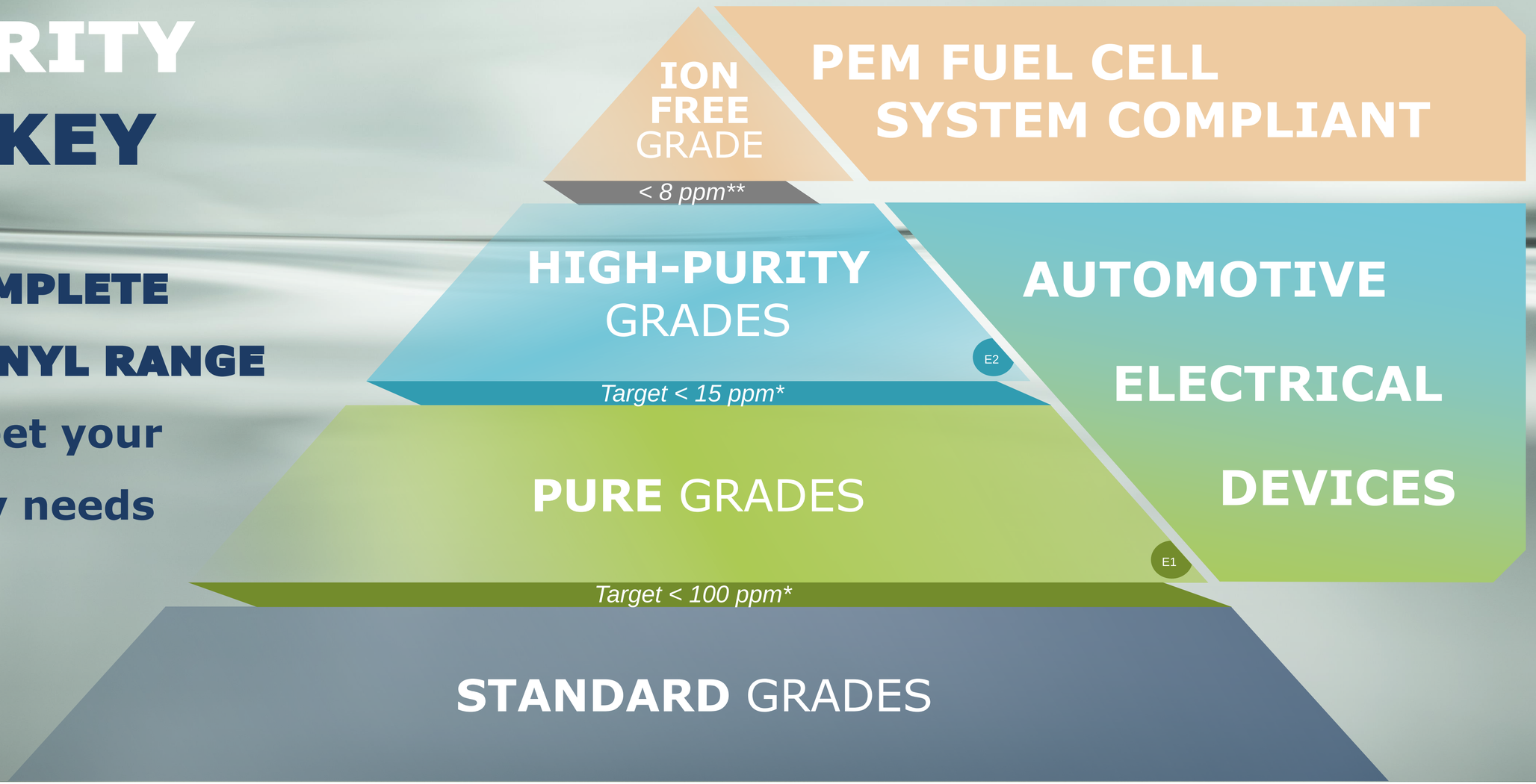
PURITY IS KEY

A COMPLETE TECHNYL RANGE to meet your purity needs



* *Internal elution test on halogen content*
** *Internal Ion Migration test*

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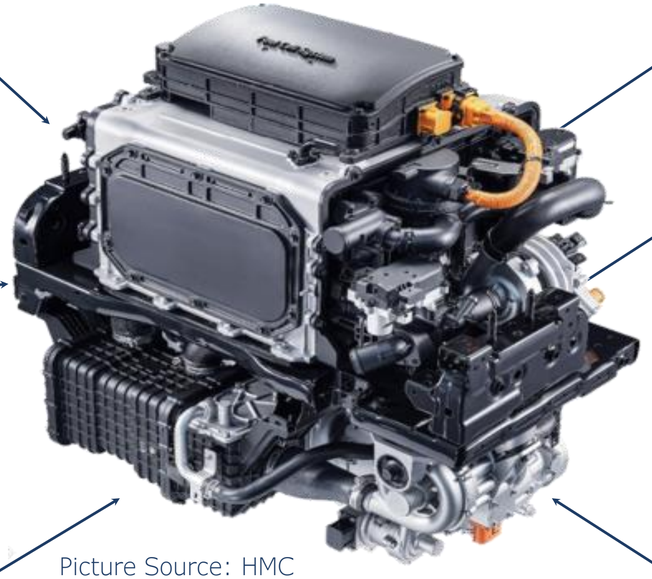
SOLUTIONS DESIGNED FOR

FUEL CELL SYSTEM COMPONENTS

Hydrogen Manifold PRV*
Safety valve to control pressure

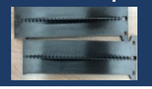
End Cell Heater
To to improve cold start of fuel cell

Water Trap
To retain and exhaust condensated water generated through the electrochemical reaction



Picture Source: HMC

Impact Beam
To protect from outside shocks / impacts



H_2 Tank Liners
Permeation protection / base body for composite structure

Humidifier
To provide moisture through H_2 and air line not to dry membrane through which H+ ion pass

End plate
To clank force between right and left slide

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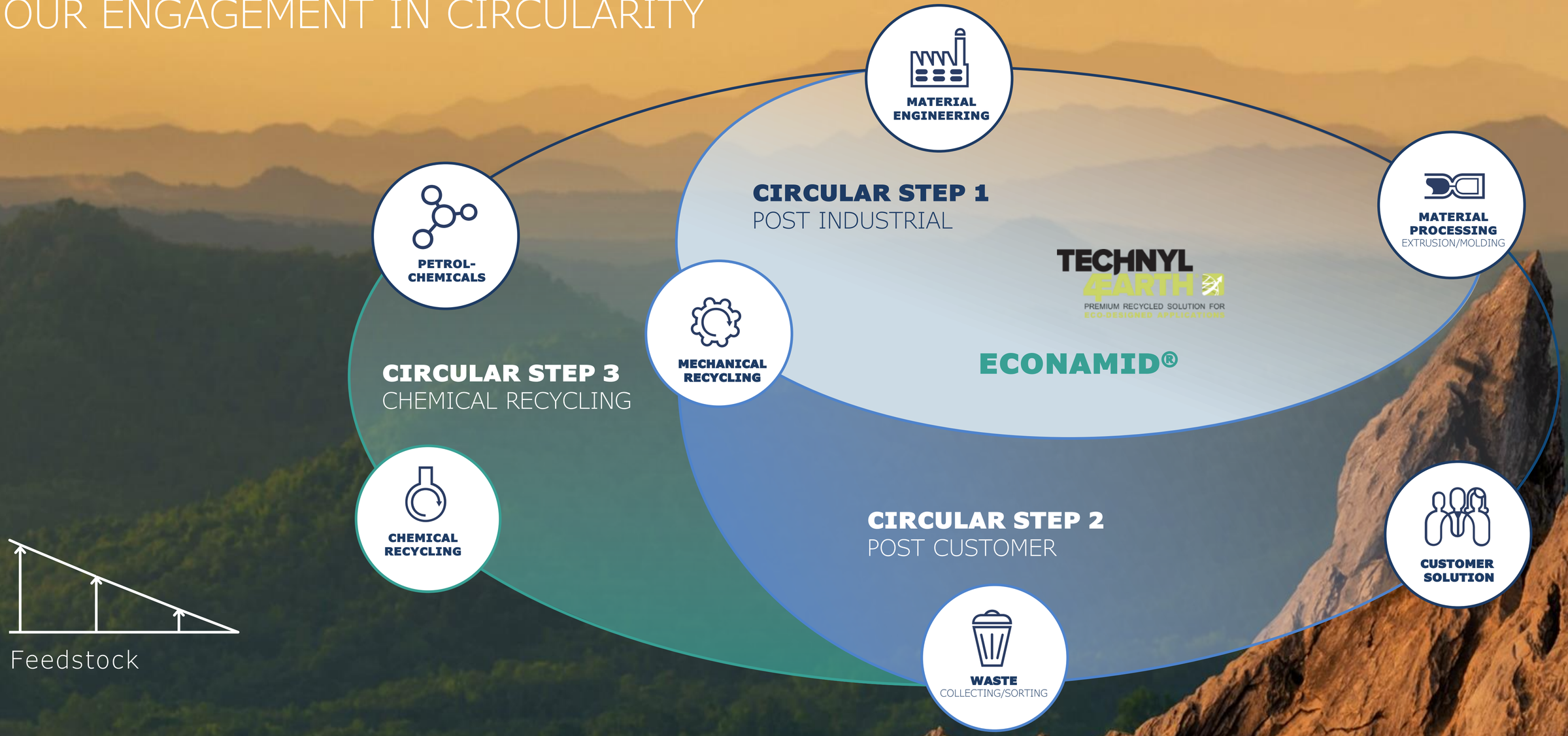
CIRCULARITY

OUR ENGAGEMENT IN CIRCULARITY



with

TECHNYL®
you rely on…

… an **advanced service offer** to link material and application innovation

… differentiated solutions for new **thermal management** applications

… an advanced toolbox for **orange PA compounds** tailored to your needs

… more than 20 years experience in **HFFR PA** compounds and a wide UL certified product range

… **high purity PA** compounds for sensitive electronics and fuel cell applications

… strong engagement in **sustainable PA solutions**

Boost your e Mobility components with TECHNYL by DOMO!

NEW ENERGY VEHICLES

OUR EXPERTISE AT YOUR SERVICE

Q&A

Tristan Jobert
Business Development Manager Auto
Polytechnyl SAS | Usine de Belle Etoile
69190 Saint-Fons | France
Tel: +33 67361 2814| Tristan.Jobert@domo.org
www.domochemicals.com
www.technyl.com

Tobias Epple
Business Development Manager New Mobility
DOMO Engineering Plastics Europe
Hermann-Mitsch-Strasse 36A
79108 Freiburg | Germany
Tel: +49 172 766 0968 | Tobias.Epple@domo.org
www.domochemicals.com
www.technyl.com

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