

# 2<sup>nd</sup> Agents Meeting 2019

## Paryls\* Sulfone Polymers

# Agenda

- 1) General Market situation / Challenges Opportunities
- 2) UJU
- 3) Parlys\*Sulfone Polymers
- 4) News – mPPSU (PPSU/PSU-Blend) patent of Akudel 22000 ends
- 5) Applications

# General Market Situation

- Availability of Sulfone Polymers:  
After huge shortage in 2015 and 2016 for Solvay and BASF material as well as for UJU material from 4th Quarter 2016 to end of 1st Quarter 2017. The Availability is good.
- Prices  
Prices for sulfone polymers are stable.
- Competition  
Competition between UJU, BASF and Solvay will be stronger. All of them increasing capacity

# Challenges & Opportunities

## Challenges

- Trade policy of USA
- BREXIT
- Economy of China
- Automotive Industry slows down

## Opportunities

- + Still many Companies are purchasing only from one source and are forced to qualify a 2nd and 3rd source (new risk management guidelines)
- + Metal replacement is still a growing matter of companies strategy
- + Plumbing and Water industry as well as Medical Sector still growing market
- + PEI availability is stable again. Anyway strategic purchasing is aware of Sabic Monopoly and the new PEI capacity in Singapore is not intended for Automotive applications.

## Sulfone Polymer Producers :

Manufacturer	Brands	Capacity 2017	Planned/Installed
Solvay	Udel, Veradel, Radel	28.000 t/a	38.000 t/a
BASF	Ultrason S, E, P	18.000 t/a	24.000 t/a
Sumitomo	Sumikaexcel (PES)	3.000 t/a	6.000 t/a
UJU	Paryls* PSU, PES, PPSU	6.000 t/a	6.000 t/a
Chang Chun Group (CCP)	Longlite	-	t.b.v. (<500 t/a)
Kingfa	Visulfon	-	t.b.v. (<500 t/a)

## UJU the Parlys\*Producer:

- Est. 2013
- 6.000 t/a capacity
- QM-certificate IATF 16949
- Over 70 patents
- Approx. 110 employees



## UJU produces Parlys\* Sulfone polymers:

	PSU	PES	PPSU	mPPSU (PPSU/PSU)
Density g/cm <sup>3</sup>	1,24	1,37	1,29	1,26
HDT A °C	185	208	207	180
Tg °C	175	226	220	-
Impact KJ/m <sup>2</sup>	5,5	6,5	68	10

## Parlys\* Sulfone polymers key attributes:

- Good chemical resistance
- Excellent electrical properties
- High dimensional stability
- High HDT A and Tg
- Inherently flame retardant
- Hydrolytically stable
- High rigidity
- Sterilizable

## Paryls\*PSU cross ref table:

UJU	BASF	Solvay
Paryls*PSU F3050 NC	Ultrason S 6010	Udel P-1700
Paryls*PSU F3150 NC	Ultrason S 3010	-
Paryls*PSU F3250 NC	Ultrason S 2010	Udel P-3703
Paryls*PSU F3150 GL20	Ultrason S 2010 G4	Udel GF-120 NT
Paryls*PSU F3150 GL30	Ultrason S 2010 G6	Udel GF-130 NT

## Paryls\*PSU main grades:

UJU	Processing
Paryls*PSU F3050 NC	Extrusion
Paryls*PSU F3150 NC	Injection molding, compounding, color masterbatches
Paryls*PSU F3150 GL20	Injection molding
Paryls*PSU F3150 GL30	Injection molding

## Paryls\*PES cross ref table:

UJU	BASF	Solvay
Paryls*PES F2150 NC	Ultrason E 3010	Veradel A-201 / 3200
Paryls*PES F2250 NC	Ultrason E 2010	Veradel A-301 / 3300
Paryls*PES F2350 NC	Ultrason E 1010	Veradel 3400
Paryls*PES F2150 GL20	Ultrason E 2010 G4	Veradel AG-320 NT
Paryls*PES F2250 GL30	Ultrason E 2010 G6	Veradel AG-330 NT

## Paryls\*PES main grades:

UJU	Processing
Paryls*PES F2150 NC	Injection molding
Paryls*PES F2250 NC	Injection molding, compounding, color masterbatches
Paryls*PES F2150 GL20	Injection molding
Paryls*PES F2250 GL30	Injection molding

## PPSU cross ref table:

UJU	BASF	Solvay
Paryls*PPSU F1150 NC	-	Radel R-5000
Paryls*PPSU F1250 NC	Ultrason P 3010	Radel R-5800
Paryls*PPSU F1350 NC	-	Radel R-5600

## Paryls\*PPSU main grades:

UJU	Processing
Paryls*PPSU F1150 NC	extrusion
Paryls*PPSU F1350 NC	Injection molding, compounding, color masterbatches
Paryls*PPSU F1550 NC	Injection molding (special plumbing grade)

## PPSU/PSU-Blend cross ref table:

UJU	BASF	Solvay
Paryls*mPPSU M1150 NC	-	Acudel 22000

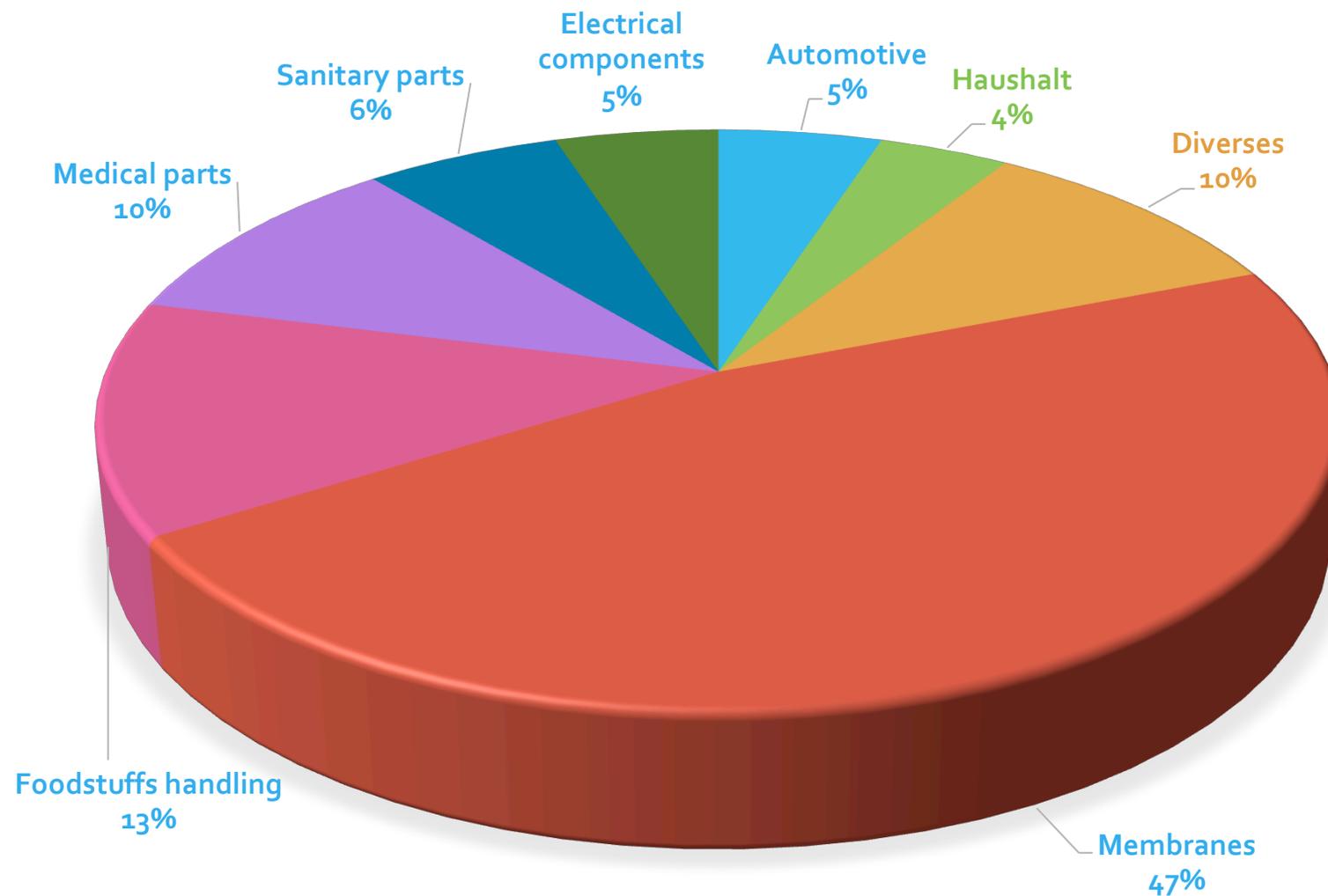
## Paryls\*mPPSU main grades:

UJU	Processing
Paryls*mPPSU M1150 NC	Injection molding

# Paryls\* Approvals:

Paryls*Grade	RoHS	SVHC	REACH	FDA 177.1655 Polysulfone resins	FDA 177.2440 Polyethersulfon resins	EU 10/2011	ISO 10993-5 in vitro cytotoxicity	ISO 10993-10 Irritation	ISO 10993-10 Skin sensitization
PSU F3150	+	+	+	+	not applicable	? SML of BPA changed 0,6 to 0,05 mg/kg food	+	+	+
PPSU F1350	+	+	+	+	not applicable	+	+	+	+
PES F2150	+	+	+	not applicable	+	+	to be verified	to be verified	to be verified

# Sulfone polymers applications:



## Plumbing & Sanitary (pressfittings):

- Parlys\* well established in US market due to NSF approvals
- In the US market PSU GF20, PPSU and PPSU/PSU-blend (Akudel 22000)
- Since 2019 Paryls\*PPSU F1550 grade with EU water certification available
- ACS (F), WRAS (UK), W270 (G), KTW cold water (G)
- Further approvals will follow [KTW hot water, ISO 9080, KIWA ATA (NL), KIWA UNI (I)]
- Internal test of customer lasting 12 to 24 month as they giving up to 50 years guarantee on their products



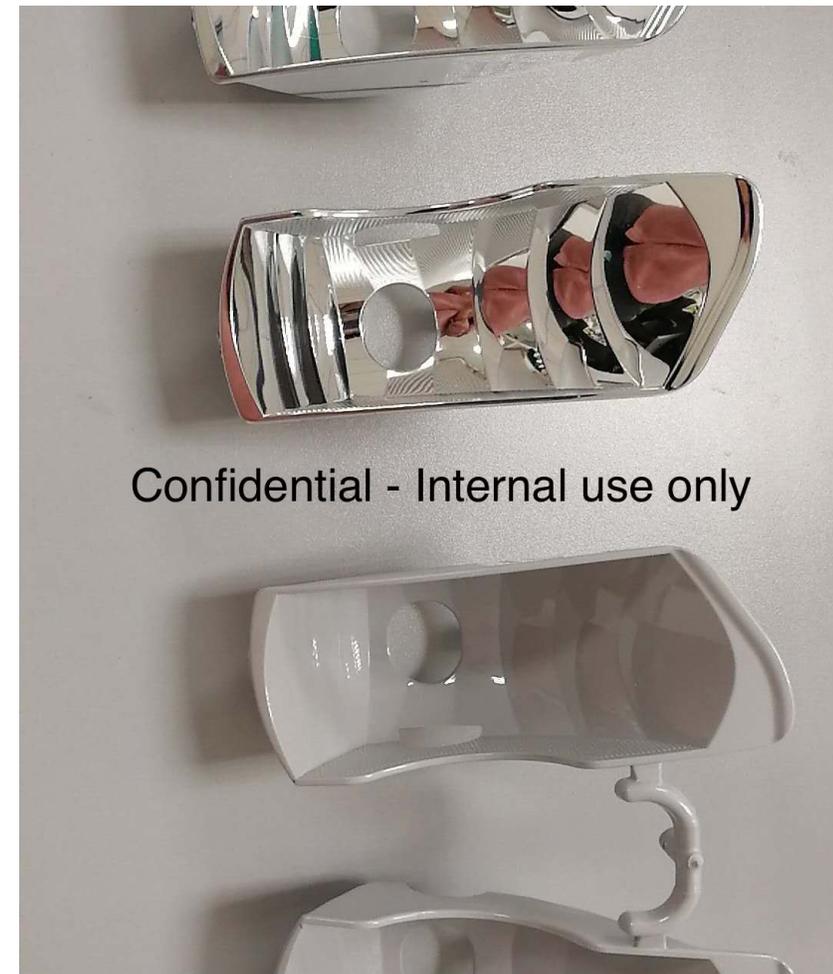
## Plumbing & Sanitary:

- Other applications: valves, cartridges, flow regulators
- Used grades:
  - PSU F3150, GL20, GL30
  - PES F2150, GL20, GL30, 2250
  - PPSU F1350, F1550
  - mPPSU M1150
- EU water certifications are usually requested
- ACS (F), WRAS (UK), W270 (G), KTW (G)



## Automotive - Headlamp Housing:

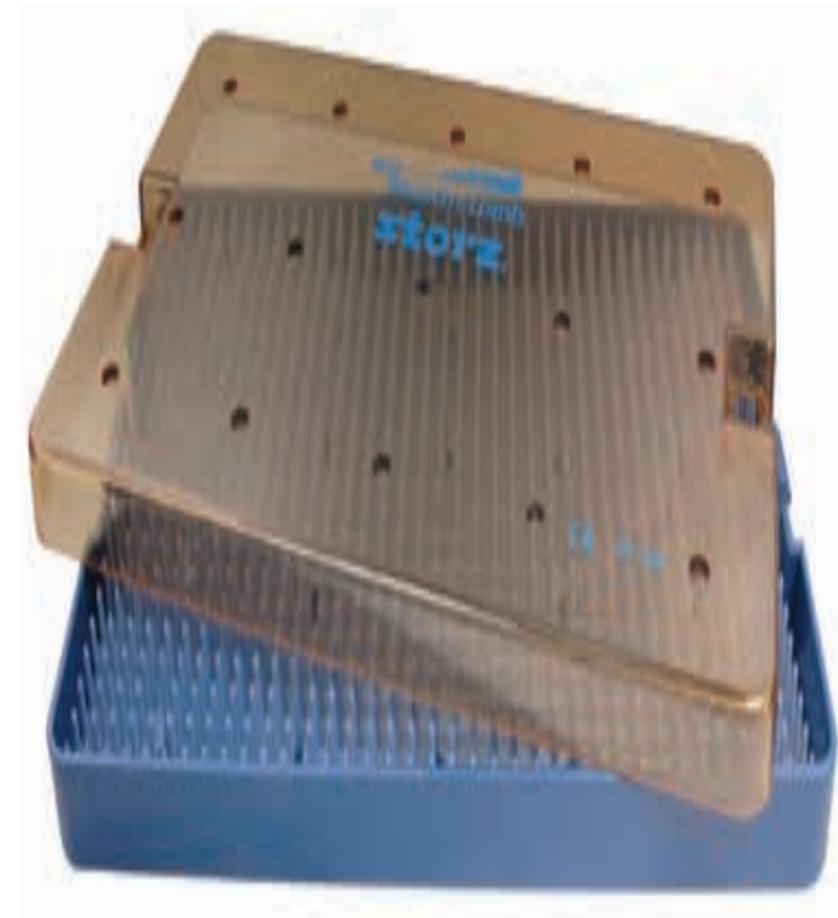
- Paryls\*PES is suitable
- PES vs PEI and BMC



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## Medical Parts:

- Paryls\* is suitable
- Paryls\*PPSU NC optical properties are remarkable



# Compounding & Masterbatches:

- Paryls\* is suitable



## Stock Shapes & Sheets:

- Paryls\* is suitable
- Stock shapes is small business for medical applications. Producers hesitate to switch. Approval cost are very high and not their core business.
- Sheets are big business for medical and aerospace applications.
- For running business they are not allowed to change the customer approved material
- Some starting to use Paryls\* for new projects



## Milking Cluster Parts:

- good application for Paryls\*PSU and PPSU



## Coffee Machines - PSU & PES:

- Biggest producer is Eugster / Frismag with single production site in China.
- Bravilor Bonamat approved Paryls\*PSU and PPSU and listed UJU has 2<sup>nd</sup> source.



## Membrane - PSU for RO (Desalination):

- - 2019/2020 -
- Reference Udel P-3500 LCD MB
- Important data: molecular weight / molecular distribution / viscosity number / oligomer content
- UJU has Paryls\*PSU F3050 M.
- UJU bought equipment to measure viscosity number and oligomer content



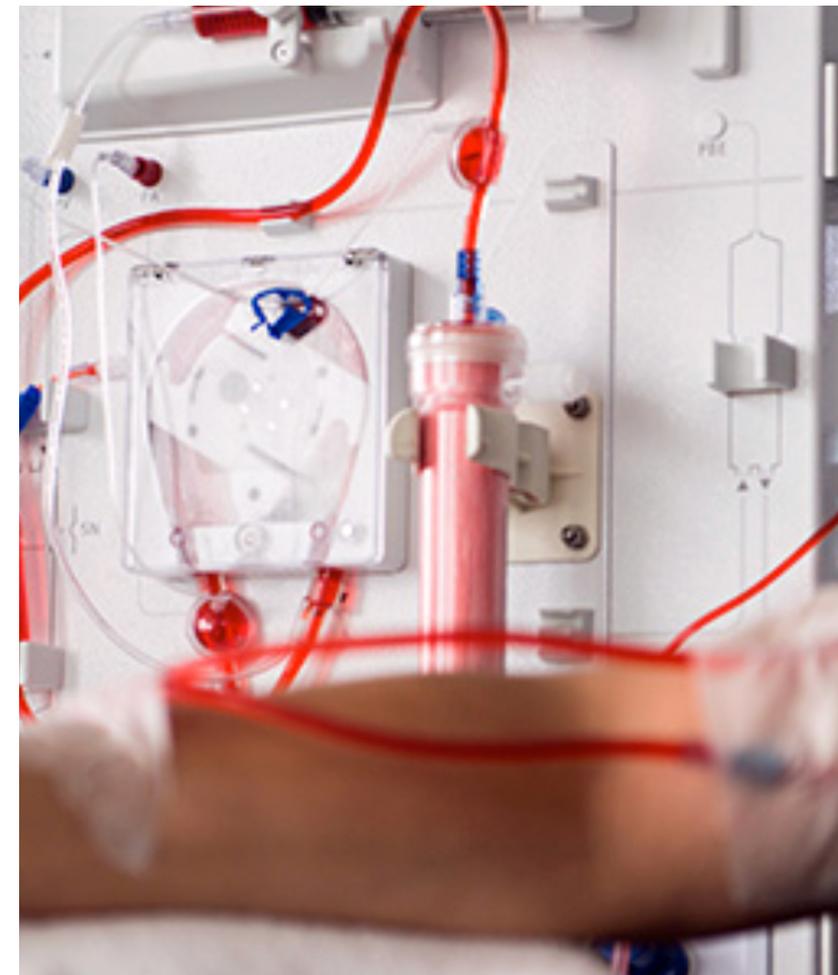
# Membrane - PES for Waterfiltration

- - 2019/2020 -
- Reference Ultrason E 6020P
- Important data: molecular weight, molecular distribution, viscosity number, oligomer content
- UJU is developing competitive grade
- PES F2050M, F2150M



# Membrane - PSU and PES for Hemodialysis

- - FUTURE -
- Important data: molecular weight, molecular distribution, viscosity number, oligomer content
- Hemo-membrane producer expecting that UJU has a technical membrane specialist
- OHSAS 180001 certified suppliers



## Aerospace / Transportation:

- - FUTURE -
- Critical success factors:
  - 1.) Mostly approval according FAR 25.853 needed
  - 2.) Also approval according OSU 65/65 (NC grades) or 55/55 (Opaque grades). PPSU needs additives to pass OSU testing.
- Approval phase pretty long and expensive



# Partnership for Sustainable Growth

