

Chemical properties	C2F4	100 g/mol
	F	19 g/mol
	C	12 g/mol
	Al	2.7 t/m3
Incineration high temp.	$C_2F_4 + 2 H_2O + O_2 \Rightarrow 2 CO_2 + 4 HF$	
Properties of PTFE	Density	2.2 t/m3
	Melting point	327 °C
	Reactivity	cold = inert
	Temperature of use	< 260 °C
	Toxic reaction products	> 400 °C
Mass Flow	Liquid semi-product	40 kg/a
	PTFE content in the semi-product	45 %
	Part on the surfaces	30 %
	Part remaining in the baths	70 %
PTFE Flow	PTFE on the product	5.4 kg/a
	PTFE worn out	18.75 %
	PTFE to aluminium recycling (end of life)	61.25 %
	PTFE to MSWI (end of life)	10 %
	PTFE to landfill (end of life)	10 %
	PTFE in waste water	12.6 kg/a

Estimation of damages

Env. Impact factors	Fluorides into the waste water	3.2 UBP/g F
	HF into atmosphere	13.3 UBP/g HF
	Use of MSWI	594 UBP/kg Abfall
	Toxic FHC's into the atmosphere (H4C2F2)	6500 UBP/g
	Use of landfill (CH)	36 UBP/L
	Use of landfill (UTD, germany)	142 UBP/g

Load balance	Use of 40 kg/a liquid semi-product	39,770 UBP/a
	Use of 40 kg/a liquid semi-product	37,105,361 UBP/a
Monetarisation	1 t CO2 - Emission	1,000,000 UBP
	1 t CO2 - Emission	150 CHF
Accumulated damage	Use of 40 kg/a liquid semi-product	5,566 CHF/a

Esimation of benefits

The typical piece	Coated surface	18,000 m2/a
	Mean density of PTFE	0.300000 g/m2
	Typical piece, L	10.0 cm
	Typical piece, B	8.0 cm
	Typical piece, H	1.0 cm
	Typical piece, volume	0.000080 m3
	Typical piece, weight	216 g
	Typical piece, surface	0.0196 m2
	Typical piece, PTFE weight	0.005880 g
	PTFE concentration in typical piece	27 mg/kg
	Nr of typical pieces	918,367
	Weight of all typical pieces	198,367 kg
Types of benefits	Lubrication properties	80 %
	... whereof critical (no more product)	60 %
	Chemical resintence	20 %
	Altefco turnover	4.5 Mio CHF

Algorithms for the estimation of benefits

A	Turnover of the client going down because product is no more possible (e.g.	
	Nr of typical pieces in machines	551,020
	Turnover of Altefco with these pieces	2,700,000 CHF
	Turnover ratio	0.01
	Lost turnover of machines	270 Mio CHF

Due to missing lubrication properties pieces will have a shortet lifetime

B	Nr of typical pieces in machines	183,673
	Life time with use of PTFE	20 a
	Life time without use of PTFE	5 a
	Price of the piece without PTFE	0.80
	Cost for use of pieces with PTFE	0.90 Mio CHF
	Cost for use of pieces without PTFE	2.88 Mio CHF
	Benefit due to use of PTFE	1.98 Mio CHF

C	Corrosion due to missing chemical resistance	
	Nr of typical pieces in machines	183,673
	Turnover of Altefco with these pieces	0.90 Mio CHF
	Turnover ratio	0.30
	Value of the products	2.10 Mio CHF
	Corrosion within	2.0 a
	Benefit due to use of PTFE	1.05 Mio CHF/a

D	Turnover of Altefco	4.50 Mio CHF/a
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Aggregated benefit	Use of 40 kg/a liquid semi-product	277.53 Mio CHF/a
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%		
	76	0.76
	24	0.24
100 g C2F4 ==> 80 g HF		
COF2, HF		

Info Altefco
 Guess by Altefco
 Guess by Altefco

PTFE to environment (cold)	1.0125	kg/a
PTFE to Al recycling	3.3075	kg/a
Al recycling with flue gas (F) treatment	0 %	
Al recycling without flue gas (F) treatment	100 %	
TEFLON to MSWI => HF =>	0.54	kg/a
PTFE to landfill (VVEA CH) (cold)	0.54	kg/a
PTFE to MeOH sludge	12.6	kg/a

Worstcase estimate
 Acidification

Derived from AOX (worst case)
 Ökofaktoren Schweiz 2021, Tabelle 24
 Ecoinvent 3.9.1. municipal solid waste CH
 Ökofaktoren Schweiz 2021, Tabelle 36, analog Br
 Ökofaktoren Schweiz 2021, Tabelle A
 Ökofaktoren Schweiz 2021, Tabelle A

16.4 UBP/kg

case A) only HF but no toxic HFC's

case B) only toxic HFC's, no HF

1 kg NMVOC - Emission

12000 UBP

1 kg NMVOC - Emission

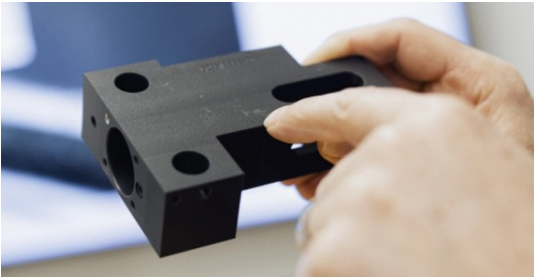
9 CHF

Use of 40 kg/a liquid semi-product

27,829 CHF/a

0.030 mg/cm²

zB. 10 x 8 x 1 cm³



Limit for application of the PFAS restriction

50 mg/kg

B

A

Machines that cannot be produced without Altef-/Ematef-pieces

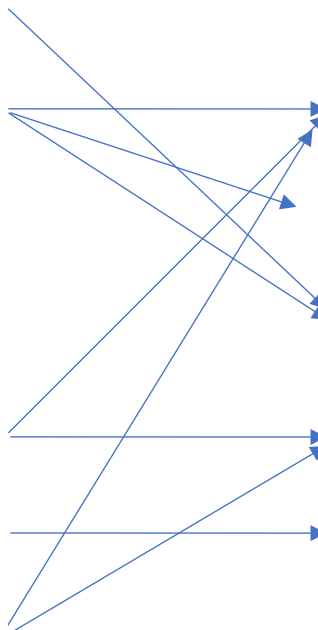
C

D

40-50% of ca. 10 Mio CHF for ALTEF und EMATEF

blood pump)

The Altefco piece will cost typically 1% of the cost of the machine



Zero effect	1.0125	kg/a
Fluorides in the waste water (F ⁻)	9.99	kg F/a
HF in waste air	0.00	kg HF/a
Alternatively: Toxic FHC's into waste air (p.e. H ₄ C ₂ F ₂)	5.70	kg H ₂ C ₂ F ₂ /a
Use of MSWI's	13.14	kg/a
Use of landfills	0.54	kg/a
Use of UTD landfill (germany)		kg/a



	Load
UBP = Ecopoints according to the methodology of ecological scarcity	31,956 UBP/a
	0 UBP/a
	7,805 UBP/a
	37,065,600 UBP/a
	9 UBP/a
	0 UBP/a

