



(PPA)

# Polymer Processing Aids

A large, clear, cylindrical container, likely a hopper or silo, is shown in a factory setting. The container is filled with a clear, viscous liquid. The background shows industrial machinery and pipes. The container is divided into three vertical sections by a blue vertical band. The text 'A little something to give you big ideas!' is overlaid on the blue band.

A little  
something  
to give you  
**big ideas!**

**Kynar® PPA can be used to improve the processing performance of all types of polyolefins including but not limited to: LLDPE, LDPE, HDPE, and PP.**



*Listed are some articles published on polymer processing aids.*

### References

V. Vora, J. Gingras, "Increasing Throughput, Reducing downtime", Modern Plastics & Polymers, pp. 190-192 (January 2012)

V. Vora, F. Beaume, "For Best-in-Class Performance", Modern Plastics & Polymers, pp.71-72 (September 2012)

V. Firdous, PP. Tong. "Sharkskin Melt Fracture: Effect on LLDPE Film, Properties", Journal of Plastic Film & Sheeting, Vol 8 – October 1992 pp 333 – 340







J. Gingras, F. Beaume, P. Elmerch, J. Laffargue, "Polyvinylidene Fluoride Based Polymer Processss Aids, Their Evaluation and Conditioning Procedures," Tappi Proceedings, Indianapolis, IN; September 2004

### Recommendations for Masterbatch Preparation

Masterbatches should not have a Kynar® PPA content above 5% since this can lead to poor dispersion. A level around 2% is desirable. The table below can be used to determine the percentage of masteratch to be included in the final mixture to obtain the required level (in ppm) of Kynar® PPA.

Kynar® resin ppm targeted in final mixture	Use of masterbatch at...				
	1%	2%	3%	4%	5%
200	Add 2%	Add 1%	Add 0.67%	Add 0.5%	Add 0.4%
400	Add 4%	Add 2%	Add 1.33%	Add 1%	Add 0.8%
600	Add 6%	Add 3%	Add 2%	Add 1.5%	Add 1.2%
800	Add 8%	Add 4%	Add 2.67%	Add 2%	Add 1.6%
1000	Add 10%	Add 5%	Add 3.33%	Add 2.5%	Add 2%

**Kynar® PPA resins offer a range of fluorinated processing aids used to improve the manufacturing of:**

-  **LLDPE, LDPE, HDPE, PP**
-  **Film products**
-  **Extrusion blow molding**
-  **Pipes and tubing (PEX, HDPE,..)**
-  **Extruded fibers**
-  **Wire and Cable**

### **Final Product benefits**

Kynar® PPA resins bring the following benefits:

- Elimination of Melt fracture (shark skin)
- Improvement of film transparency
- Improvement of smoothness and surface aspect
- Improvement of product appearance
- Improvement of mechanical properties
- Reduction of gels

### **Processing benefits**

Kynar® PPA resins are specially designed to enhance the efficiency of operating conditions:

- Maintenance time reduction
- Reduction of die build-up
- Consistency of production
- Smoother extrusion conditions
- Lower energy consumption
- Reduction of cycle times and quicker transition
- Reduction of potential negative interaction with other film additives such as antiblock and HALS
- Reduction of extruder torque
- Reduction of polymer critical shear rate

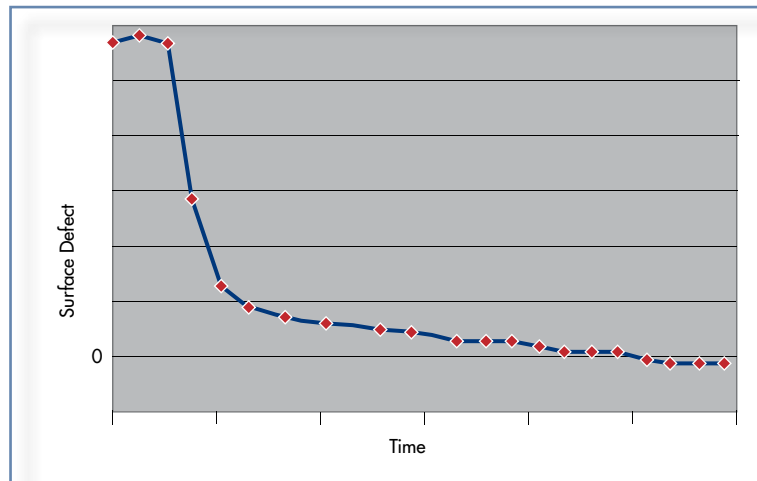
### **Conditions of use**

Kynar® PPA resins are mainly used as an additive at 150 -1200 ppm levels to overcome the processing problems encountered with polyolefins.

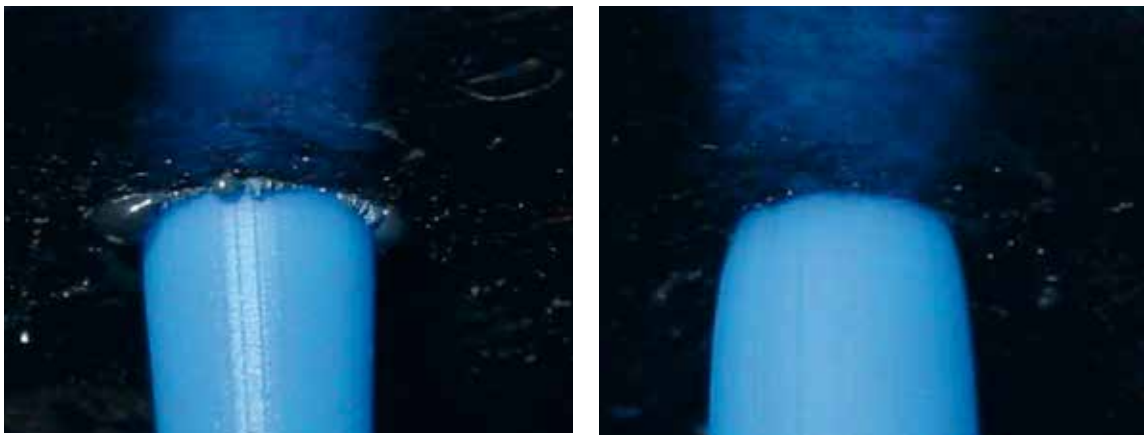
For such low level of content, it is highly recommended to use Kynar® PPA in the form of a masterbatch for an accurate and a uniform dosing.

Most Kynar® PPA resins are safe for applications involving contact with food articles and meet USA FDA and European food contact regulation.

→ **Kynar® PPA** improves surface defect



→ **Kynar® PPA** reduces unwanted die build-up



→ **How to use Kynar® PPA**

**The two main requirements to get the best out of Kynar® PPA products are:**

- a good dispersion;
- a uniform dosing at the typical low concentration level needed with Kynar® PPA.

**For a converter, this is achieved by using:**

- either a resin that already contains Kynar® PPA;  
(many resin producers propose polyolefin grades which contain Kynar® PPA with appropriate and uniform dosage and good dispersion);
  - or a masterbatch:
    - containing typically from 1% to 5% of Kynar® PPA;
    - which can be diluted into their standard resin;
- (many masterbatch manufacturers propose PPA masterbatches based on Kynar® PPA).

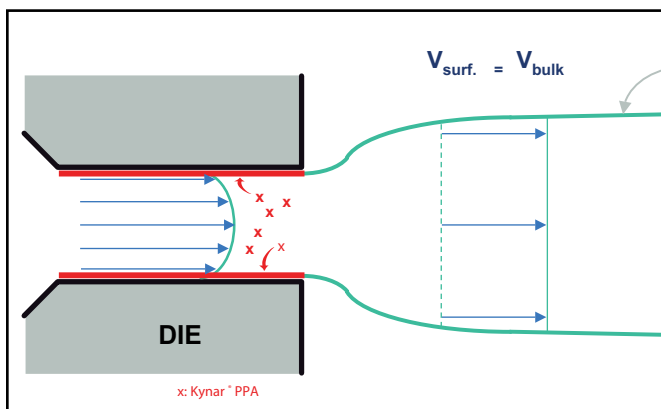
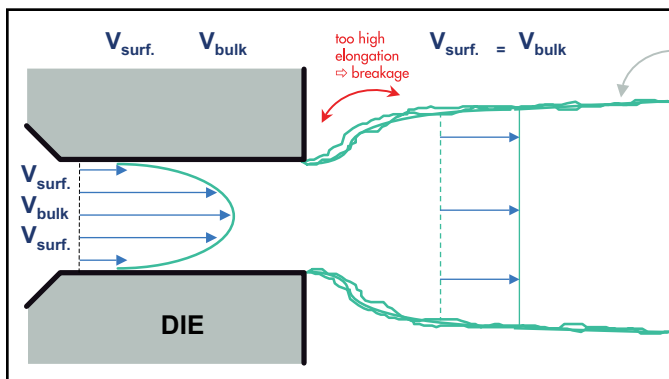
→ **Technical and sales support for Kynar® PPA**

From process improvements to product visuals, Arkema has dedicated equipment and field personnel able to bring technical assistance to achieve complete solutions to challenging issues.

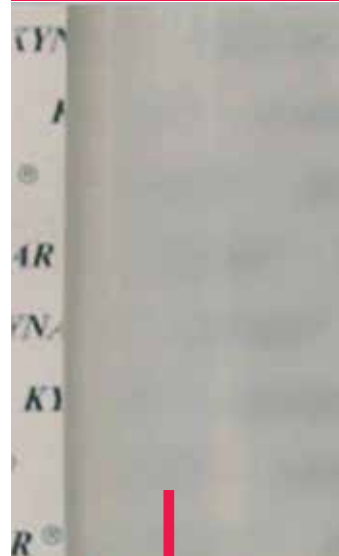
# BENEFITS OF KYNAR® PPA

Today neither poor appearance nor reduced output is acceptable when extruding polyolefins, but both problems can be easily solved.

By eliminating the surface defects and allowing a higher operating output, Kynar® PPA improves both the quality and profitability of the extrusion process:



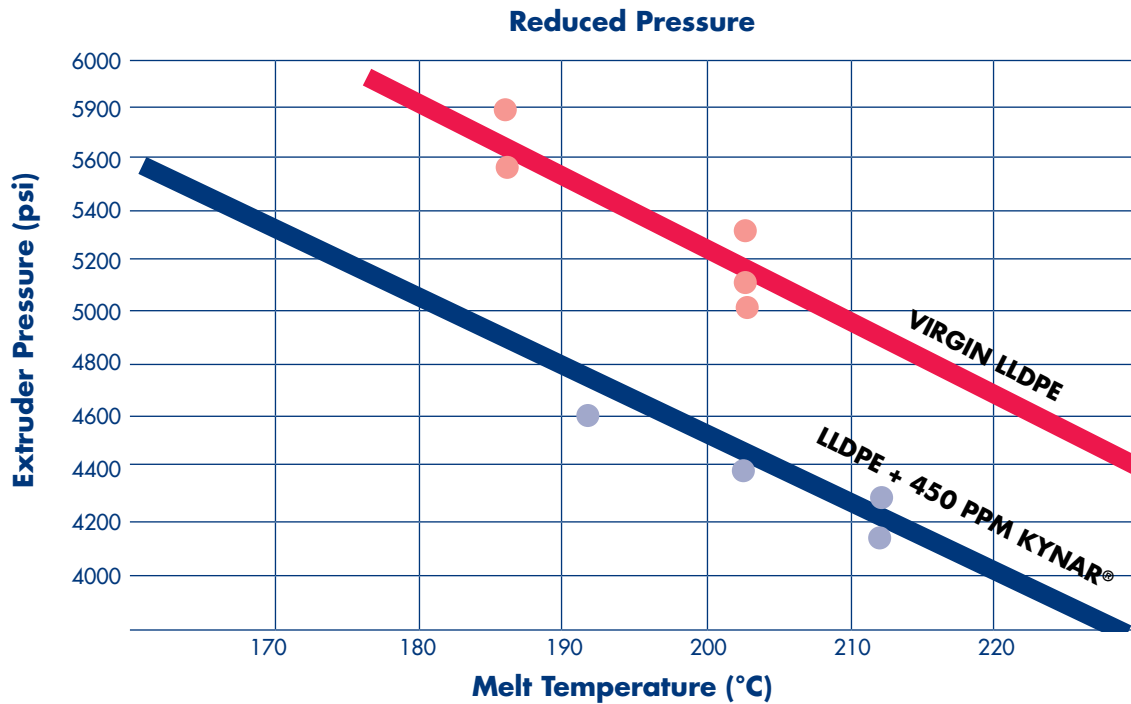
**Kynar® PPA**  
eliminates melt-fracture  
also called shark-skin  
(LLPE blown film)



**Kynar® PPA**  
improves the surface  
appearance and the  
smoothness.



→ Typical results of **Kynar® PPA** (@450 ppm) in linear low density polyethylene blown film extrusion



**Higher Output, Reduced Power**

	<b>Melt Temp (°C)</b>	<b>Screw Speed (RPM)</b>	<b>Output (lbs/hr)</b>	<b>Required Power (Amps-% of Max)</b>	<b>Extruder Head Pressure (PSI)</b>	<b>Film Quality</b>
LLDPE (control) No Additive	196	34	66(a)	17	5,400	Clear no melt fracture
LLDPE (control) No Additive	200	80	150	22	5,500	Continuous melt fracture
LLDPE with 450 ppm Kynar® PPA Additive	200	80	155(b)	18	4,300	Clear no melt fracture
LLDPE with 450 ppm Kynar® PPA Additive	200	102(c)	204	22	5,000	Clear no melt fracture

(a) Onset of melt fracture observed above this output level.

(b) No attempt was made to increase output.

(c) Maximum screw speed on available equipment.



**Select from several grades of Kynar® PPA to match process requirements**

**Best PPA selection is based on:**

- Temperature of the extrusion or molding process and the resulting polymer melt temperature**
- Melt index of the polyolefin that requires the use of a PPA**
- Shear rate of the process**
- Need for a synergist formulation based on other additives to the polymer being processed**

Consult your Arkema technical representative to choose from the following grades of Kynar® PPA (Kynar® PPA grades are available as either pellet or powder depending on the preference of the masterbatch producer.)

Kynar Flex® 3120-50; 3121-50  
Kynar Flex® 2800-20; 2821-00  
Kynar Flex® 2800-00; 2801-00

Kynar® 5300; 5301  
Kynar® 8600; 8601  
Kynar Superflex® 2500-20; 2501-20

## For more information on Kynar® PVDF

Phone: 1-800-Kynar-50 (1- 800-596-2750)

Fax: 1-610-205-7497

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