



Self-plasticised PVC compounds

New materials for a more sustainable future

Dr. Belén Pascual, Head of R&D

Miquel Boix, Head of R&T

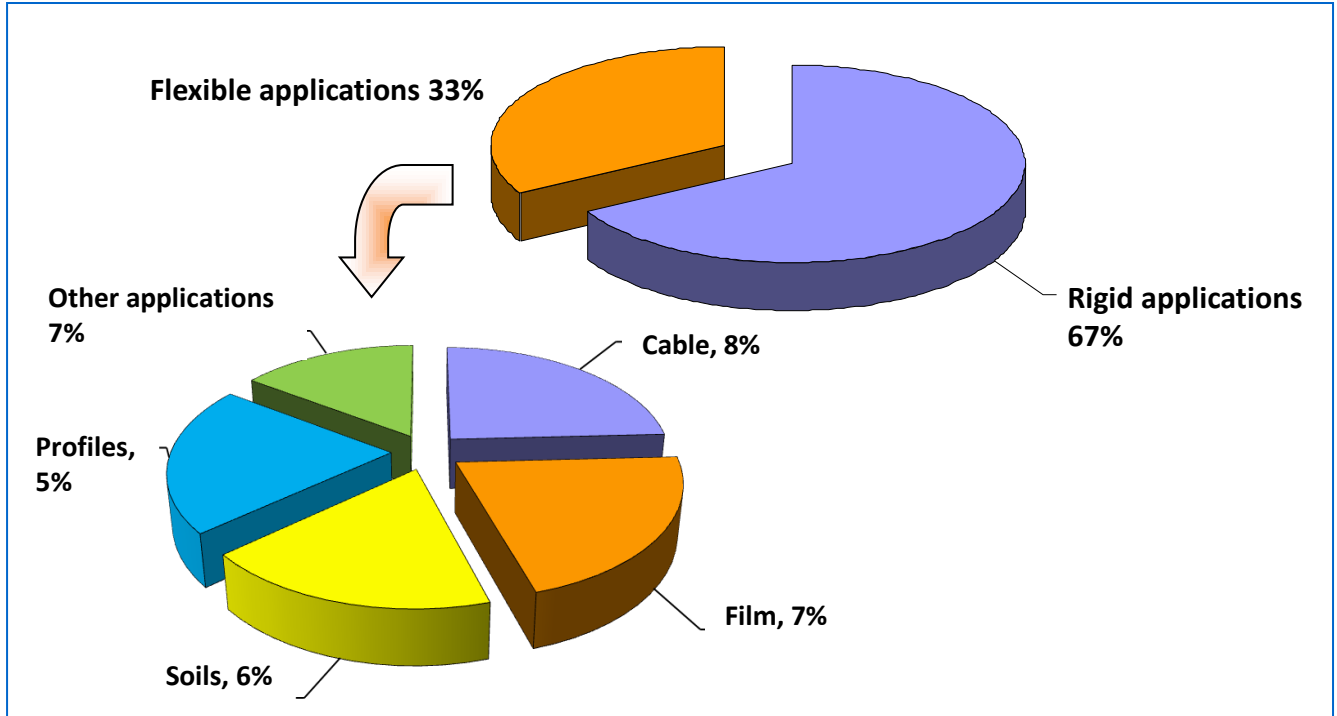
Ercros Plastics Division

September 2014

Plastic Division Production Capacities

Products	Production Capacity (kt/year)	Applications
Dichloroethane (EDC)	150	VCM manufacturing
Vinyl chloride (VCM)	200	PVC manufacturing
Polyvinyl chloride (PVC)	175	Profiles, pipes, film,...
PVC Compounds	20	Profiles, pipes, film,...

Applications of PVC



Flexible PVC products (1)

- **Plasticizers** for obtaining flexible PVC products.
- **Some restrictions** for the use of low molecular weight plasticizers such as DEHP.
- Plasticizers of higher molecular weights (**DINP, DIDP, ...**) and alternative plasticizers (Hexamoll DINCH, adipates, benzoates, ...).
- **New alternatives** on the market for plasticizers from bio-sources.
- Each raw material has **its difficulties in handling and its efficiency** in the transformation process.

Flexible PVC products (&2)

Differences in alternative DEHP plasticizers:

- **Low degree of plastification:**
 - Higher dosage to achieve the same Shore A hardness.
 - Increase of cost of the formulation.
- **Longer mixing time for plasticizer absorption:**
 - Decrease in productivity.
- **Increase of gelling time:**
 - Higher extrusion temperatures.
 - Increase in energy consumption.

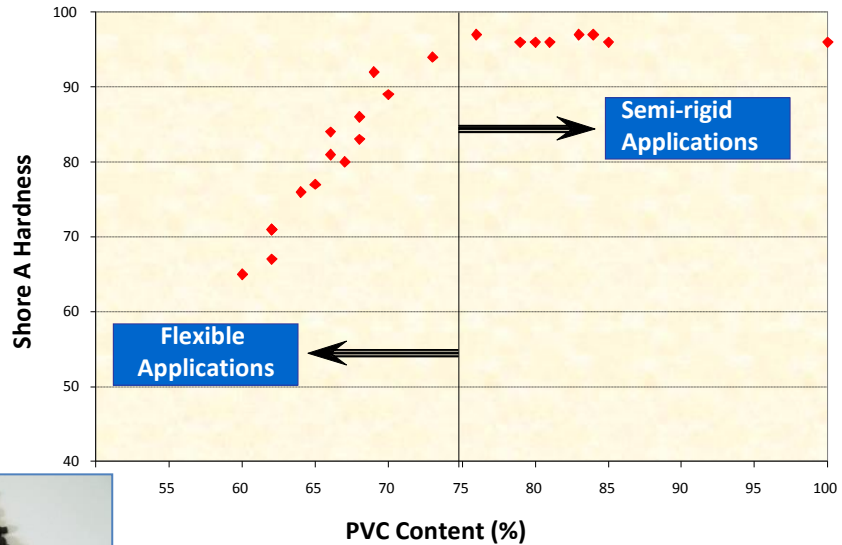
Alternatives to the external plasticization

- Obtaining flexible PVC compounds **with less or no content of plasticizers** has been a goal in recent years.
- **Copolymerization and blending with polymers with lower T_g** than PVC are alternatives to the use of plasticizers.
- There are **different types of copolymers** described on the literature:
 - Graft copolymers.
 - Tri-block copolymers via FRP.
 - Tri-block copolymers via LRP.
 - Random copolymers.

R&D in Plastic Division

- ErcrosFlex[®] development is in the **final stage in the pilot plant** and in process to industrial scale.
- Ercros **has resins available in order to obtain compound formulations** according to customer's applications and requirements.
- The properties of ErcrosFlex[®] compound formulations are presented in a range from **65-90 in Shore A hardness**.

ErcrosFlex® Products Range

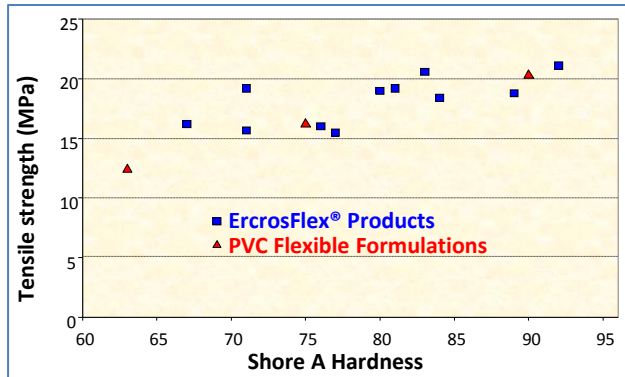
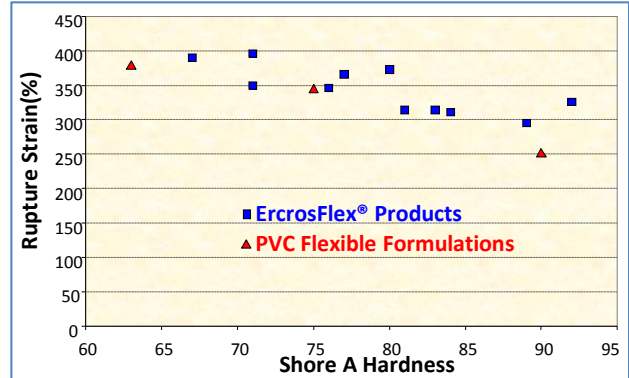


Formulation:

- 3 phr organic stabilizer, 3 phr ESBO

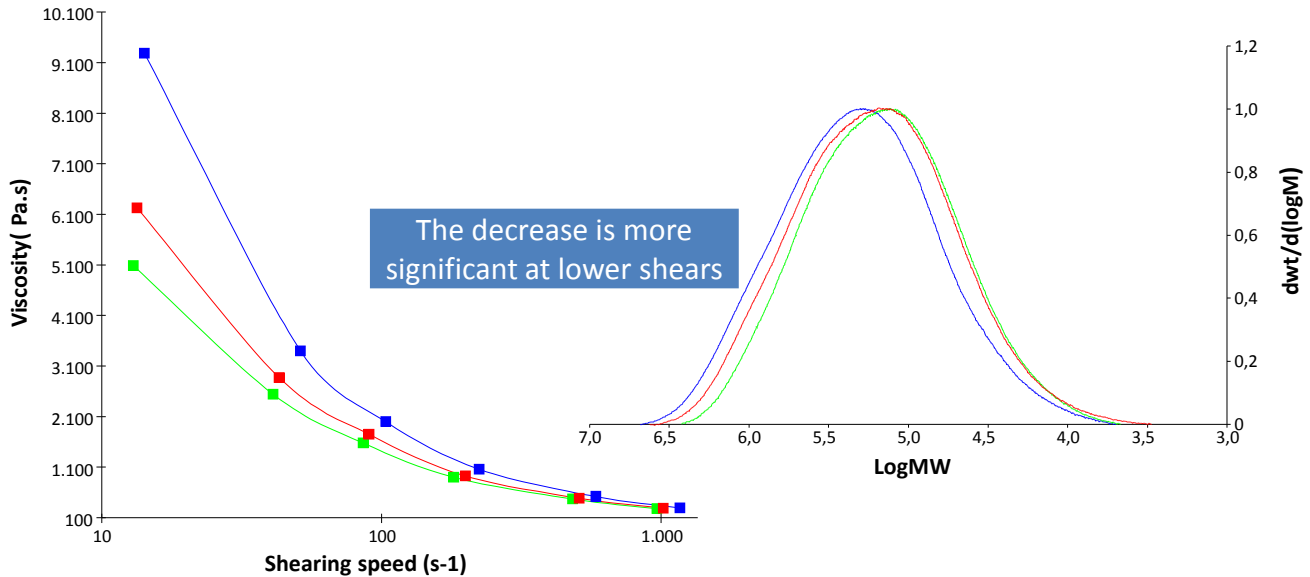
Mechanical properties

Component	ErcrosFlex® Products	Flexible formulations
ErcrosFlex®	-	-
Organic stabilizer	3	-
PVC Resin k 64	-	100
DINP	-	40, 60, 80
Stabilizer Ca/Zn	-	1



ErcrosFlex® compounds have similar tensile properties in a wide range of Shore A hardness to plasticized formulations.

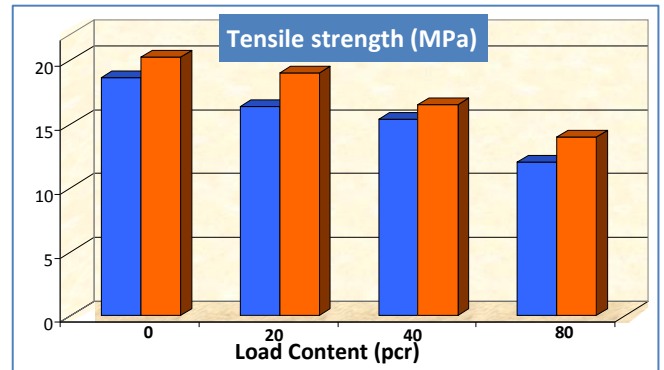
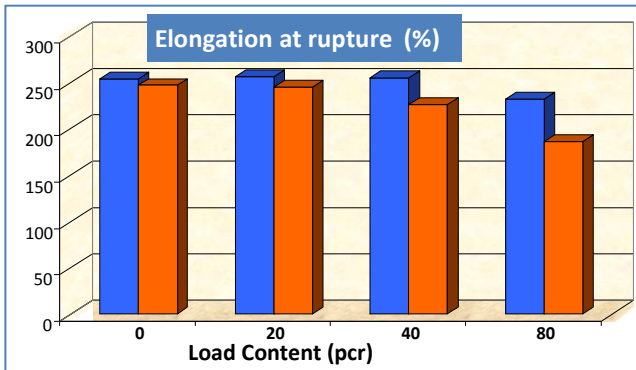
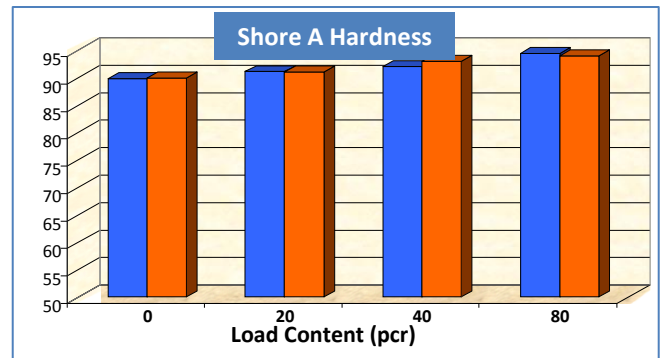
Rheological behavior vs molecular weight



Possibility of viscosity adjustment to the processing technique used (injection, extrusion, calendering, ...).

Mechanical properties with filler

Component	ErcrosFlex® Products	Flexible Formulations
ErcrosFlex®	100	-
Organic stabilizer	3	-
PVC Resin k 64	-	100
DINP	-	40, 60, 80
Stabilizer Ca/Zn	-	1



- Similar Shore A hardness.
- Higher deformation at break even with large amount of filler.

ErcrosFlex® advantages

Compared with PVC plasticised compounds, the ErcrosFlex® products have the following advantages :

- Similar range of Shore A hardness **without any external plasticizer**.
- Lower transformation temperature (lower energy consumption).
- **No migration** of hazardous substances.
- Longer time of use.
- Improved **chemical resistance**.
- Improved **behavior at low temperatures**.



ErcrosFlex® Applications (1)

ErcrosFlex® products are suitable for manufacturing **flexible colored and transparent** products by any industrial processing technique: extrusion, calendering, injection ...

Principios	Historia	Ercros hoy
<p>2</p> <p>El propósito general de un proyecto industrial que contribuya al bienestar de la sociedad, que confíanza que en ella han honrados y que permita entre la capacidad y el nivel de quienes...</p> <p>... dirigida por de la empresa, principios básicos: para sus empleados, es, absoluto respeto, satisfacción de las necesidades y calidad total</p>	<p>Los antecedentes de Ercros se remontan al año 1897, cuando Francisco Cros instala su primera fábrica de productos químicos en Barcelona. En 1904, la empresa se constituye en sociedad anónima y pasa a denominarse S.A. Cros.</p> <p>Al igual que S.A. Cros, Unión Explosivos Río Tinto, S.A. (ERT) era una empresa con gran tradición en el sector químico español. Sus orígenes hay que buscarlos en Vizcaya cuando, en 1872, se crea la Sociedad Española de Explosivos. Esta empresa, fundada en 1904, a los 24 años de su creación, se fusiona con Unión Española de Explosivos. Esta se fusiona con Minas de Río Tinto, constituida en 1904.</p> <p>En 1987, S.A. Cros y S.A. ERT, el principal accionista, suponen el inicio de la fusión de ambas empresas.</p>	<p>Ercros es la sociedad matriz que controla y ubica la corporación y posee, directa e indirectamente, participaciones en las sociedades filiales y asociadas.</p> <p>El 31 de mayo de 2011, Ercros Industrial, S.A. fue inscrita en el Registro Mercantil de Aragón por parte de Ercros.</p>



ErcrosFlex® Applications (& 2)

ErcrosFlex® products could be **applied in the following sectors:**

- Building and construction:
 - Vinyl floorings.
 - Roofings.
 - Ponds.
 - Pools.
- Electrical and electronic materials for cables.
- Gasket for home appliances and windows.
- Laminates for publications and decorations.
- Hoses.

Conclusions

- ErcrosFlex® is a new range of flexible PVC compounds without external plasticizers with a Shore A hardness from 90 to 65.
- Ercros establishes a **dialogue with each customer** to adjust the formulations of ErcrosFlex® to the technical needs of each application and finished product.





Dr. Belén Pascual, Head of R&D. Plastic Division

bpascual@ercros.es

Domingo Font , Head of Sales of Specialities in Plastic Division

drfont@ercros.es

www.ercros.es