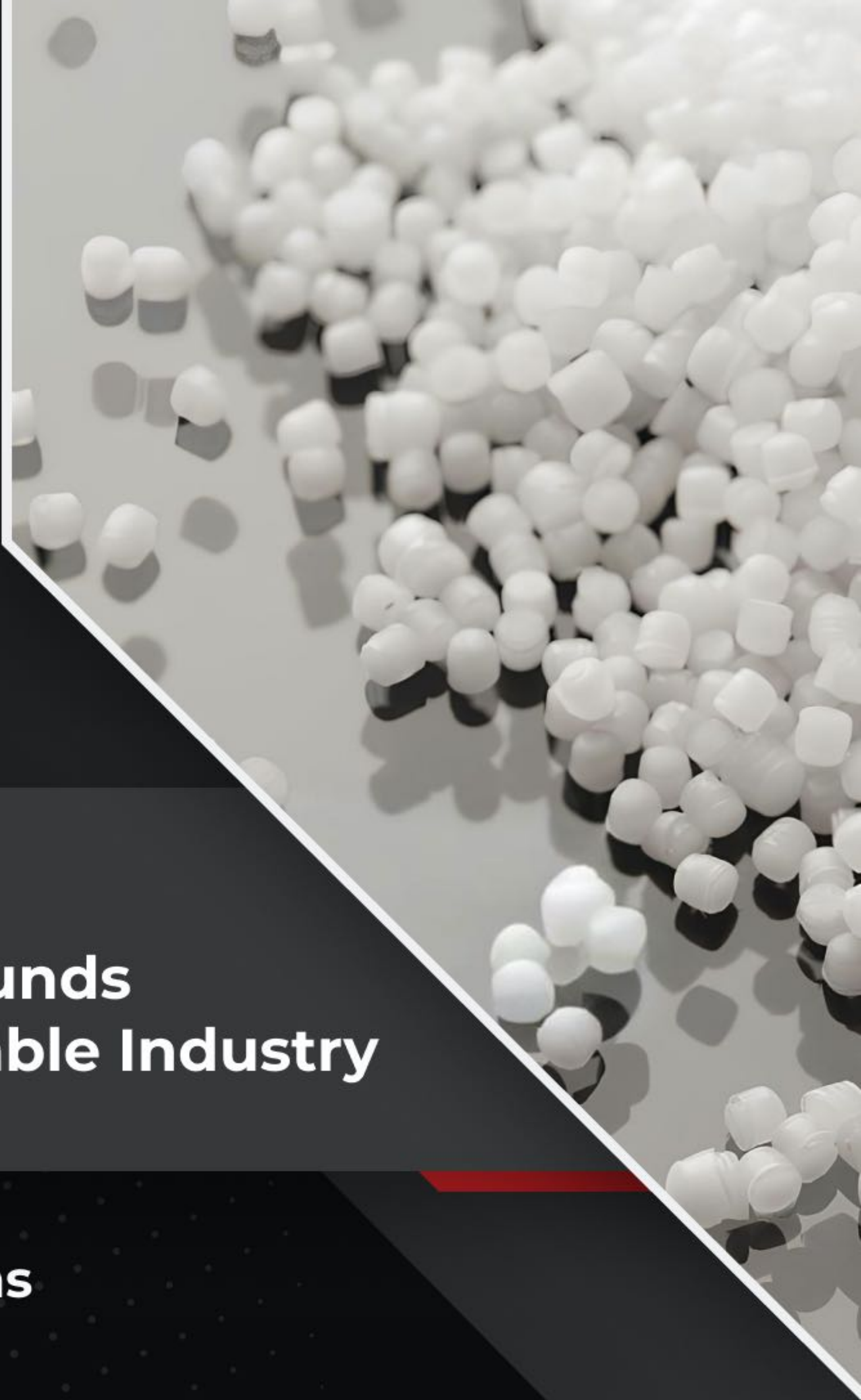




GRANULE WORLD
Joint Stock (pvt) Co,



Introduction to:
**Polyolefin Compounds
in the Wire and Cable Industry**

- PE & PP insulations
- Black jacketings
- HFFR materials

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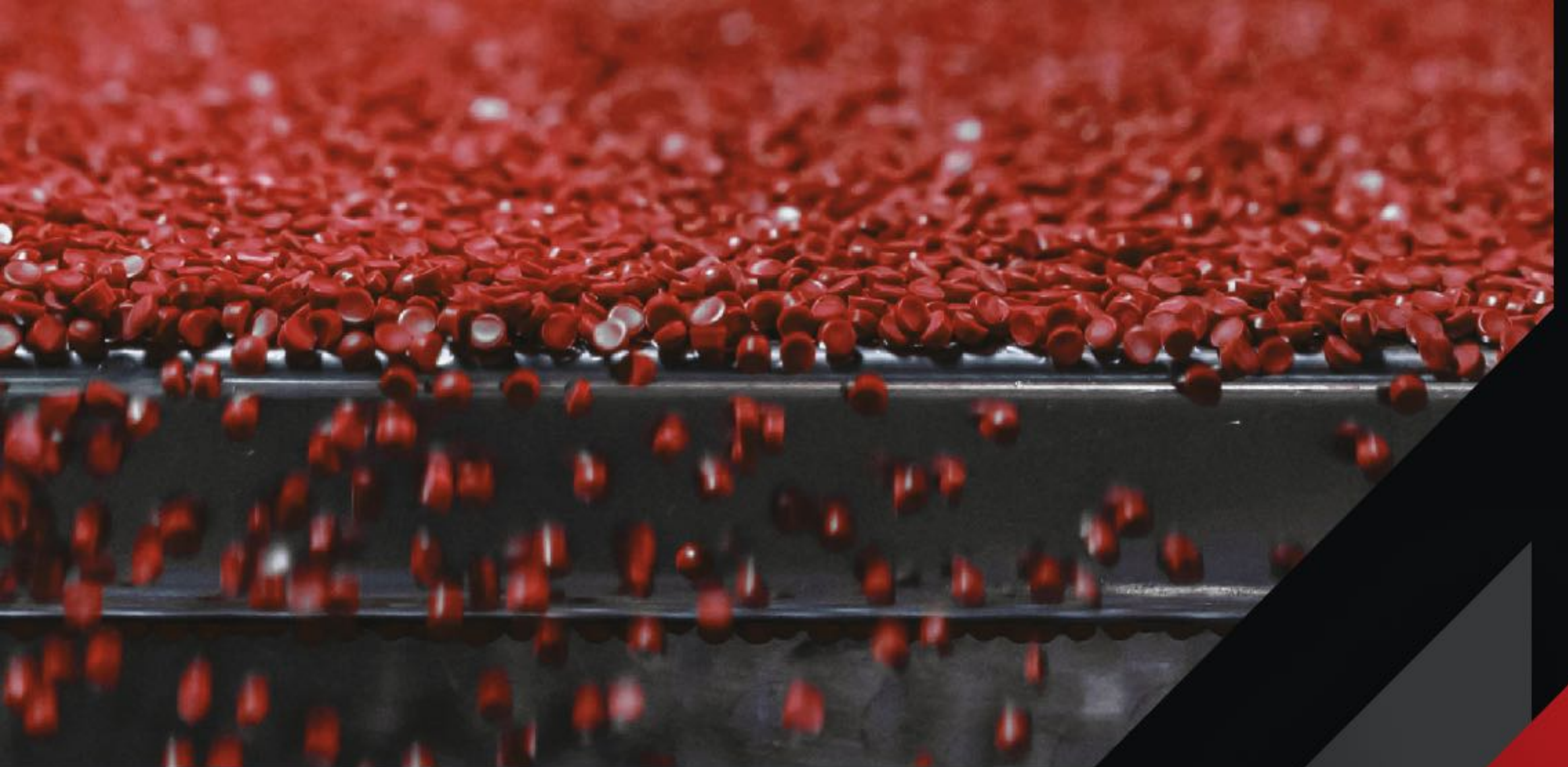
Company History

Granule World Production Company (Private Joint Stock) was established in 1994 on a 17,000-square-meter plot in the Ravand Industrial Town of Kashan. It started operations with one production hall and one production line, in response to the urgent needs of domestic industries and manufacturers, including wire and cable industries, the automotive industry, and others.

With nearly 30 years of experience in producing various types of soft and rigid PVC granules, color Master-Batches based on PVC, HFFR materials, and black jacketing materials based on polyethylene, the company now operates with:

- 3 production halls,
- 11 granule and Master-Batch production lines,
- Advanced laboratory equipment,
- Skilled and dedicated personnel.

The annual nominal capacity of PVC production is 54,000 tons, adhering to the highest quality standards in line with national and international benchmarks.

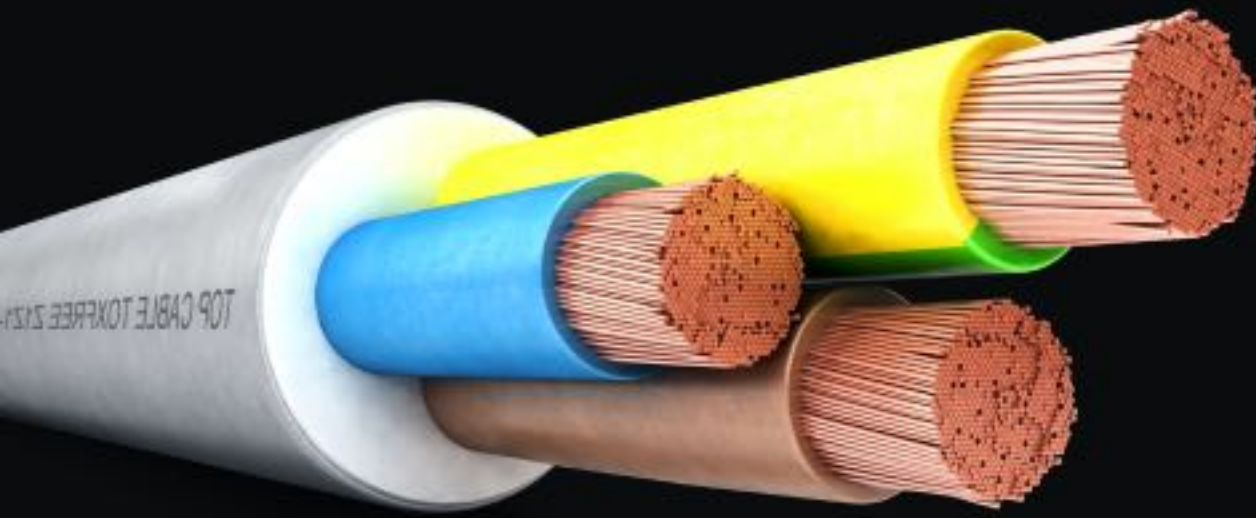


Products

Granule World Company provides four diverse product categories for various industrial applications:

- **PVC Granules:** Used for insulation of copper and aluminum cables, including power cables, flame-resistant cables, building wires, telecommunication and automotive wires, IT cables, military cables, and acid-resistant low-smoke flame-retardant compounds.
- **Filler Granules:** Designed for wire and cable industries.
- **Master-Batches:** Used in rubber, plastic, home appliances, and wire and cable industries.
- **Polyethylene-based Insulating, Coating, and Filler Granules:** Including HFFR (Halogen Free Flame Retardant), Black Jacketing, and LSZH (Low Smoke Zero Halogen) compounds.

Introduction to Halogen-Free Cables

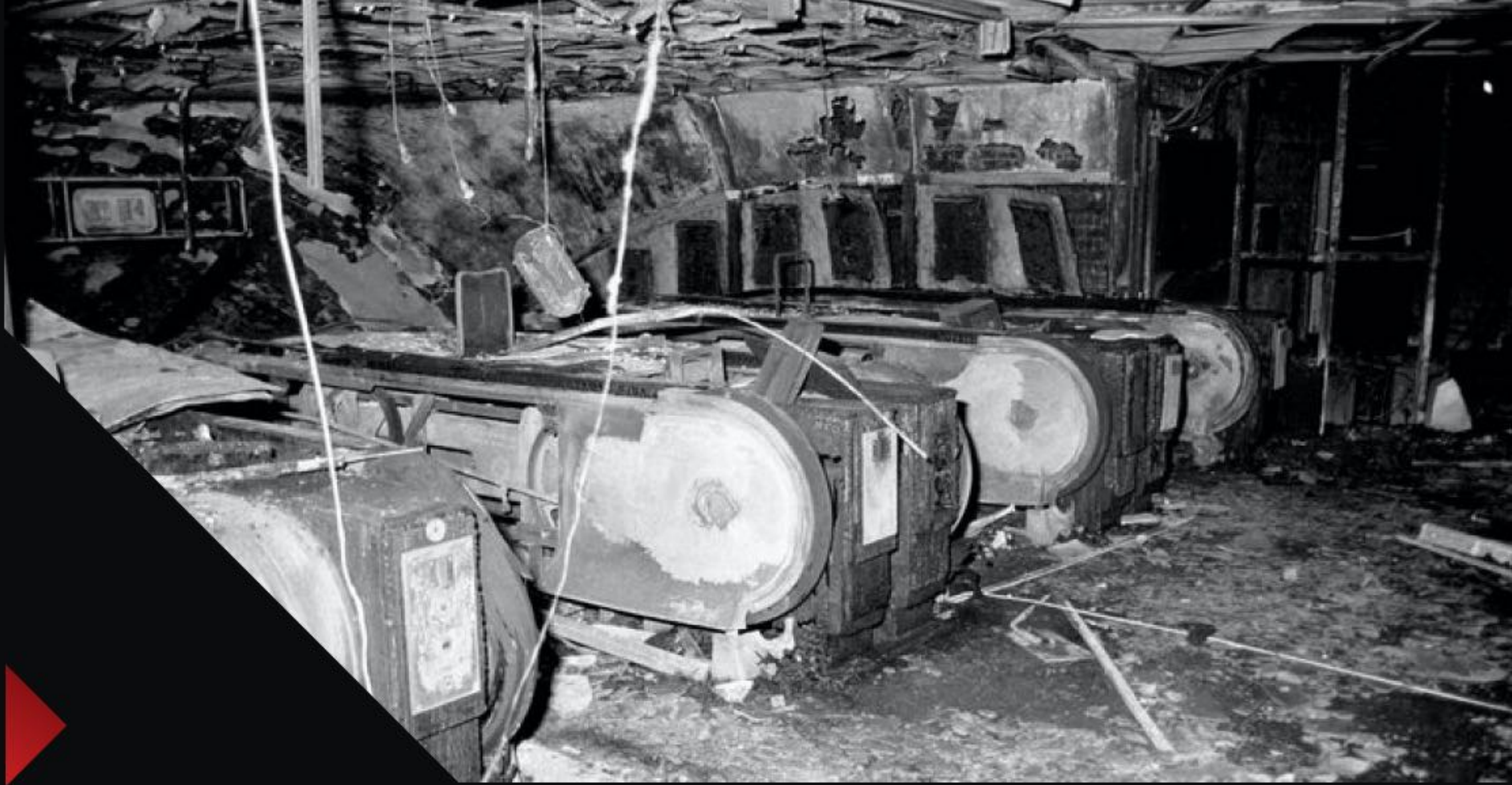


Halogen-free cables are increasingly used for electrical transmission due to their high safety standards against fire and minimal damage in case of incidents.

What are Halogens?

Halogens are non-metallic elements in Group 7 of the periodic table, including fluorine, chlorine, bromine, iodine, and astatine. Combustion of halogen-containing compounds releases highly toxic gases that can cause poisoning or death upon inhalation. They can also damage electrical and electronic equipment.





History of Halogen-Free Cables

One of the most notable fire incidents occurred in London's subway station in 1987, resulting in 32 fatalities.

Investigations revealed that most deaths were caused by toxic gases and smoke from burning PVC-insulated cables.

Following this, the use of halogen-containing cables in the London subway system was prohibited, leading many industries to adopt halogen-free cables.



Halogen-free cables are widely used in:

- Telecommunication centers
- Broadcasting stations
- Public spaces such as road tunnels, subways, elevators, conference halls, cinemas, theaters, shopping centers, hospitals, airports, military facilities, and fire alarm systems.



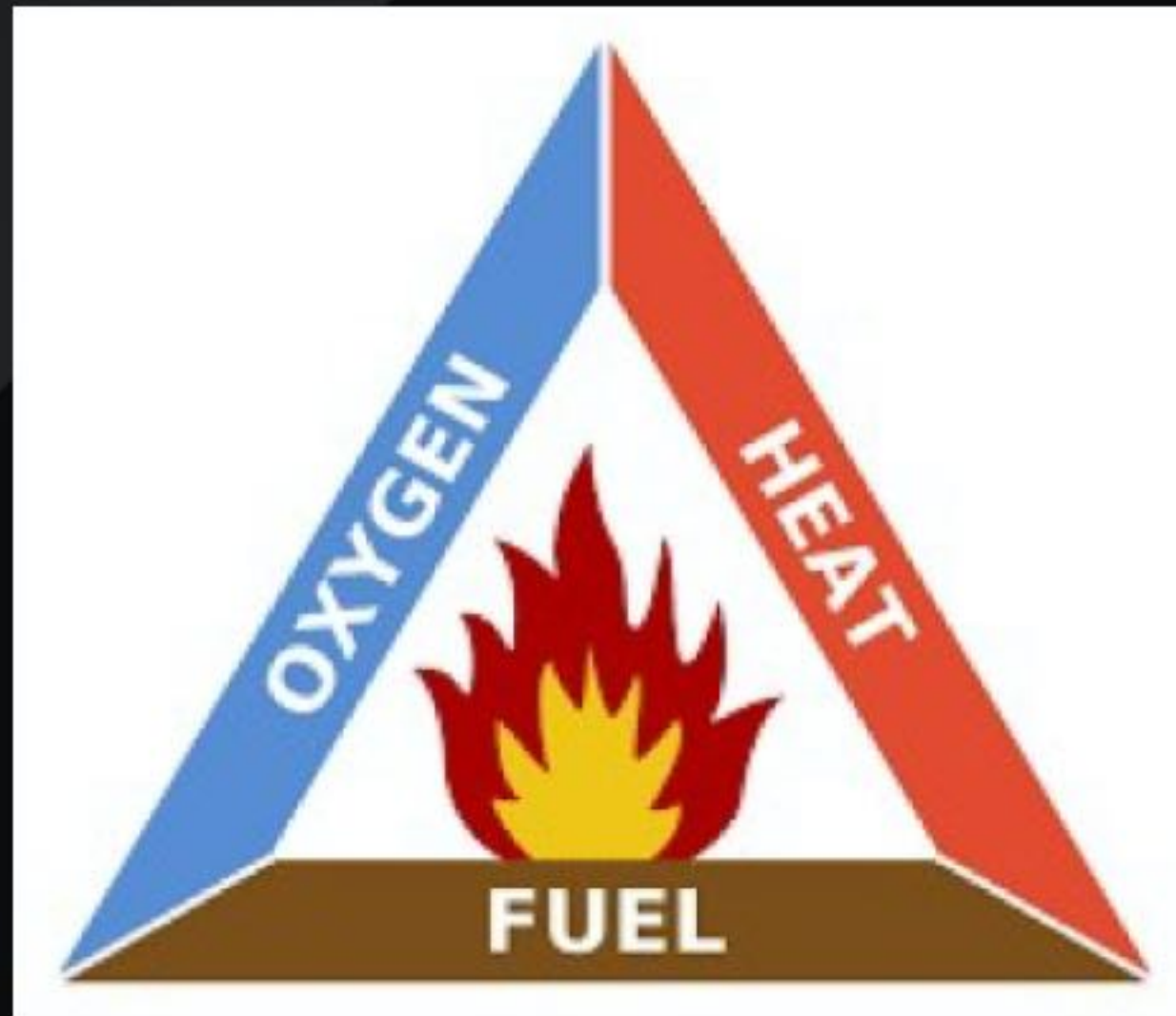
Halogen-Free Materials for Cables:

Common halogen-free materials include EVA, PE, PP, and others.

Fire Safety and Damage Mitigation

During a fire, halogen-containing materials release corrosive gases that can damage (electronic) equipment. This is especially crucial in communication centers and data facilities.





Flame Retardant Mechanisms

The fire triangle consists of three elements: fuel, heat, and oxygen. Fire can be prevented by eliminating at least one of these elements.

There are three mechanisms to extinguish flames:

- Charring Layer Formation: Forms a charred layer that blocks heat and oxygen.
Examples: Antimony oxide, melamine polyphosphate.
- Flame Smothering: Produces denser-than-air gases that reduce oxygen around the flame.
Examples: PVC and halogen-containing materials.
- Thermal Quenching: Releases water to lower the surface temperature of the material.
Examples: ATH (Aluminum Hydroxide), MDH (Magnesium Hydroxide).



HFFR Materials

Halogen Free Flame Retardant compounds contain EVA, PE, ATH, magnesium hydroxide, and other additives.

ATH prevents flame spread by releasing water during combustion, visible as bubbles on the cable surface.

To ensure the effectiveness of these materials, several international tests are conducted:

1. Vertical Flame Test (IEC 6332-1)
2. Flame Propagation Test (IEC 6332-3)
3. Smoke Density Test (IEC 61034-1/2/VDE 0472 PART 816)
4. Halogen Content Test (IEC 60754-2)
5. Oxygen Index Test (ASTM D2863)

Polyethylene Insulation and Coating for Cables

Modern communication networks require cables that are reliable, consume minimal raw materials, and provide high quality and durability. Polyethylene coatings are increasingly used in telecommunication cables, fiber optics, and power cables due to their excellent mechanical and chemical stability.

Granule World offers cutting-edge polyolefin-based compounds to meet these demands, leveraging advanced production technologies and localized formulations.



Product Groups

○ Polyethylene Insulation

HDPE, MDPE, LDPE, LLDPE insulations for telecommunication, coaxial, and network cables as per global standards.

Type: I, II and III

Class: A, B or D

Category: 3, 4 or 5

Grade: E1-11

○ Polyethylene Coatings

HDPE, MDPE, LDPE, LLDPE coatings for telecommunication and power transmission cables.

Type: II , III and IV

Class: C or D

Category: 3, 4 or 5

Grade: J1-5



○ **Polypropylene Insulation**

For fiber optics and network cables, offering superior mechanical, electrical, and thermal properties.

○ **Polyethylene Fillers**

Lightweight fillers that do not adhere to PVC insulation and coatings, reducing production costs and increasing efficiency.



Specifications table for HFFR blends for wire and cable applications

Application	Elongation at break (%)	Tensile strength (MPa)	Hardness (Shore D)	Density (gr/cc)	LOI (%)	MFI (150 c/ 21.6Kg) gr/10min	Reference Standard	Product Group	Product Code	Row
General Insulation Blends	min175	min11	53±1	1.43±0.01	32	2.5±1	IEC 60502-1 ST8 VDE 0207	HFFR	HFF-19	1
General Coating Blends	min180	min11	52±1	1.43±0.01	32	2±1	IEC 60502-1st8 VDE 0207	HFFR	HFF-18	2
Economical Filler Blends	min200	min5	45±1	1.52±0.01	39	16±0.5	IEC 60502-1 VDE 0207	HFFR	PE-9	3
LSZH Coating Blend	min220	min9	47±1	1.41±0.01	37	10±0.5	IEEE802	HFFR	LSZH-6	4

Technical specifications table for some polyolefin blends

Application	Elongation at break (%)	Tensile strength (MPa)	Carbon black Content (%)	Density (gr/cc)	MFI (190 c/ 2.16Kg) gr/10min	Reference Standard	Product Group	Product Code	Row
jacket for telecommunication cable	min500	min18	2.5±0.2	0.96	0.7±0.2	IEC 60502-1 ST3 ASTM D1248	HDPE Jacket	HD07B	1
jacket for telecommunication cale	min400	min14	2.5±0.2	0.93	0.9±0.2	IEC 60502-1 ST3 ASTM D1248	LDPE Jacket	LD10B	2
internal sheath for Power cable	min350	min16	2.5±0.2	0.94	4.0±0.5	ASTM D1248	MDPE Jacket	MD40B	3
insulation for telecommunication Cable	min550	min14	-	0.95	0.7±0.2	ASTM D1248	HFHDPE insulationFR	HD07N	4
insulation of vehicle and fiber optic Cable	-	min25	-	0.91	3.5±0.5	ISO 6722-1 IEC60794	PP insulation	CP35N	5
Filler for PVC insulation and Jacket Compound	min200	-	-	1.2	18	IEC 60227 IEC 60502	PE Filler	FPE08N	6



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INTRODUCTION TO COMPANY

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P.V.C.

Nowadays. P.V.C. plays an increasingly significant role in a diverse range of modern industries. Granule World Co. Launched the production line of various types of hard and soft P.V.C. granule as well as PVC- based colour master batches in 1993.



17000M³

Our factory with a build-up floor area of 4500 square meters has been constructed on a parcel of land with an area of 17000 square meters. It is located in Ravand Industrial Estate. We take advantage of the latest and the state-of-the-art technology in our manufacturing processes.

WELL EQUIPPED

Our well equipped and modern laboratory facility is capable of controlling the product all through the production process.

We hope to greatly contribute to the development and prosperity of Iran with collaboration to other industrialists.



Our factory has a production capacity of 80 thousand tons of various types of high qualityl P.V.C. granule in compliance with the requirements of international ASTM-IEC standard, We export our products to the Central Asian states.

Form code: FQ-07-00			Mechanical properties of Wire and Cable Insulation products						
TENSILE n/mm2	ELONGATI % ON	GRAVITY gr/cm3	STABILATY min	HARDNESS "SHORE"A	Operating Temperature (°C)	Standard	Product ID	Product Name	Row
15-16	210	1.47	60	82	70	PVC D/ IEC 60227	20	Flexible Insulation	1
16-16.5	220	1.46	60	84	70	PVC C / IEC 60227	24	Fixed installation insulation	2
16	220	1.45	75	84	70	PVC A / IEC 60502	A	Class A	3
19	240	1.39	75	84	70	TCI	GP3	Telecommunicat ion	4
19	240	1.4	90	84	90	CLASS A ISO 6722	T1	Automotive	5
21-22	240	1.41	170	87	105	CLASS B ISO 6722	T2	Heat Resistant	6
23-24	240-250	1.36-1.37	350-360	88	125	CLASS C ISO 6722	T3	Heat Resistant	7
14.5	230	1.46	60	80	70	PVC D / IEC 60227	20.2	Flexible Insulation	8
20 - 21	220 - 230	1.4 - 1.41	180 - 185	85 - 86	70	PVC E / IEC 60227	PVC E	PVC E Insulation	9
Attention:Ability to produce all the above products in different colors and with different mechanical properties according to customer needs.									

WIRE & CABLE INSULATION

HFFR COMPOUNDS

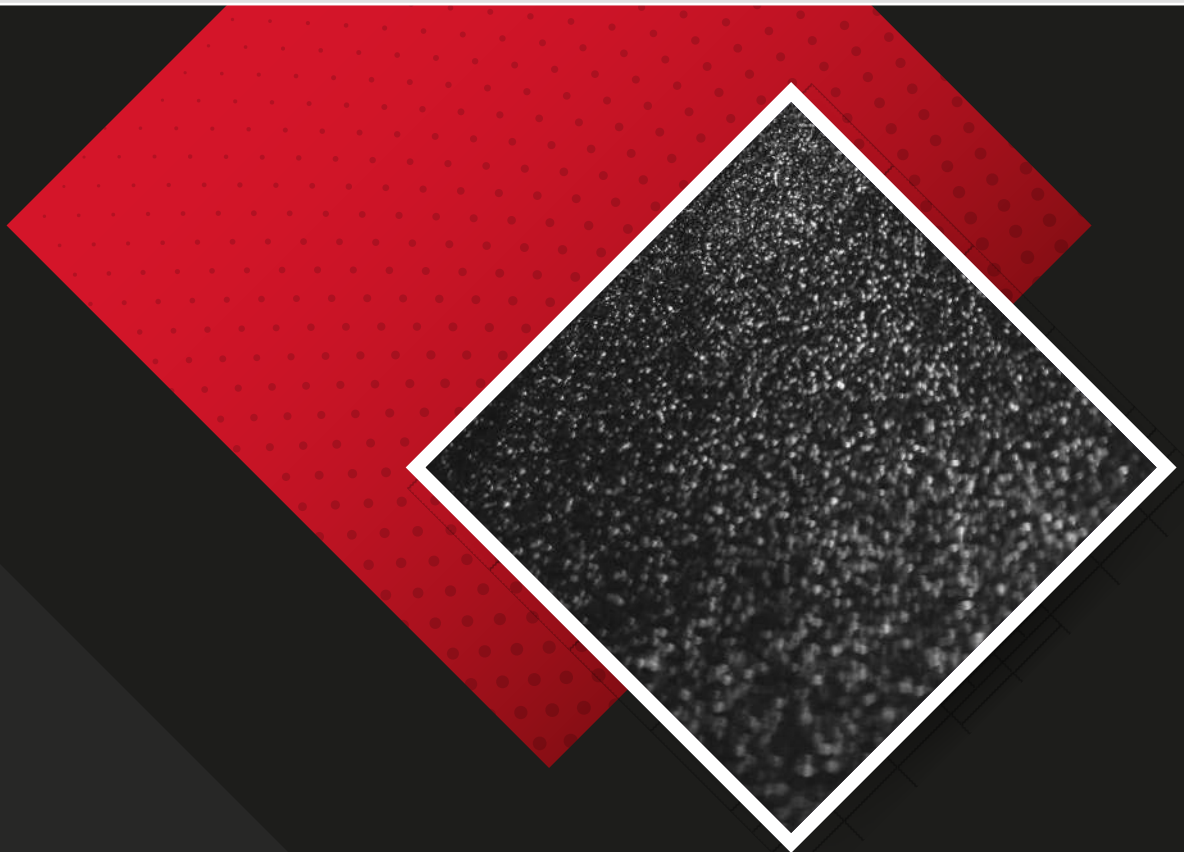
Specification table of HFFR Compounds for Wire and cable Applications										Form Code:FQ-29-00
ROW	Product Name	Product ID	Reference standard	MFI (150 c/ 21.6Kg) gr/ 10min	LOI (%)	Density (gr/cc)	Hardness (Shore D)	Tensile strength (MPa)	Elongation at break (%)	Application
1	HFFR	4432MF	IEC 1-60502 ST8 VDE 0207	3.2±0.5	32	1.43	44	min12.5	min200	Gernral flexible Compound
2	HFFR	4739MF	IEC 1-60502 ST8 VDE 0207	4±0.5	39	1.48	47	min14.5	min170	General jacket Compound
3	HFFR	5339MF	IEC 1-60502 ST8 VDE 0207	5±0.5	39	1.52	53	min12.5	min150	economic filler compound
4	HFFR	5037HF	EN -50363 M1 ,M16 , VDE 0207	18±1	37	1.43	50	min14.5	min170	high speed process for thin insulation
5	HFFR	4740LF-UV	IEC 1-60502 ST8 VDE 0207	1.3±0.3	40	1.56	47	min10.5	min150	hi-flame retardant Jacket Compound with uv resistance
6	HFFR	4830MF-UV	IEC 60840 ED 5 ST12	3.3±0.5	30	1.39	48	min15	min300	Hi-mechanical property for power cable jackets with UV resistance

Specification table of Polyethylene Compounds for Wire and Cable applications									Form Code: FQ-28-00	
ROW	Product Name	Product ID	Reference standard	MFI (190 c/ 2.16Kg) gr/ 10min	Density (gr/cc)	Carbon black Content (%)	Tensile strength (MPa)	Elongation at break (%)	Application	
1	HDPE Jacket	HD07B	IEC 1-60502 ST3 ASTM D1248	0.7±0.2	0.96	2.5±0.2	min18	min500	jacket for telecommunication cable	
2	LDPE Jacket	LD10B	IEC 1-60502 ST3 ASTM D1248	0.9±0.2	0.93	2.5±0.2	min14	min400	jacket for telecommunication cable	
3	MDPE Jacket	MD40B	ASTM D1248	4.0±0.5	0.94	2.5±0.2	min16	min350	internal sheath for Power cable	
4	HDPE insulation	HD07N	ASTM D1248	0.7±0.2	0.95		min14	min550	insulation for telecommunication Cable	
5	PE Filler	FPE08N	IEC 60227 IEC 60502	18	1.2			min200	Filler for PVC insulation and Jacket Compound	

POLYETHYLENE COMPOUNDS

FILLER & MASTERBATCH

Form code: FQ-08-00			Mechanical properties of Filler & Masterbatch products						
TENSILE n/mm2	ELONGATION %	GRAVITY gr/cm3	STABILATY min	HARDNESS "SHORE"A	Operating Temperature (°C)	Test Method	Product ID	Product Name	Row
4	120	1.84	45	60	70	PVC F / IEC 60811	8	FILLER	1
4	120	1.84	45	60	70	PVC F / IEC 60811	8.1	BLACK FILLER	2
4	120	1.84	45	60	70	PVC F / IEC 60811	8.2	WITHE FILLER	3
6	180	1.7	45	58	70	PVC F / IEC 60811	S.8	LIGHT FILLER	4
14.5	220	1.28	68	80	65-70	IEC 60811		MASTERBACH	5
.Note 1:Ability to produce PVC-based masterbatch products in different colors according to customer needs									



Form code: FQ-06-00			Mechanical properties of Wire and Cable Sheathing products						
TENSILE n/mm2	ELONGATI % ON	GRAVITY gr/cm3	STABILAT Y MIN	HARDNESS "SHORE"A	Operating Temperature (°C)	Standard	Product ID	Product Name	Row
13	240	1.47	60	78	70	ST5/IEC 1-60227	13	BLACK FLEXIBLE	1
13	240	1.47	60	78	70	ST5/IEC 1-60227	13.2	WHITE FLEXIBLE	2
15	225	1.47	60	80	70	ST4/IEC 1-60227	11	FIXED INSTALLATION	3
15.5	230	1.46	85	82	80	ST1/IEC 1-60502	ST1	ST1 FIXED INSTALLATION	4
18.5	225	1.46	100	88	90	ST2/IEC 2-60502	ST2	ST2 FIXED INSTALLATION	5
15.5	235	1.46	73	79	70	TCI	23	Telecommunications	6
21	235	1.36	80	85	70	VDE 0207	13.8	Range	7
12	350	1.38	60	76	70	TPR	N11	Thermoplastic Rubber	8
7	170	1.68	55	72	70	PVC B /IEC 60502	B.13	Bedding	9
7.5	220	1.66	45	72	70	IEC 60502	J.8	Jeridar	10
21	245	1.39	170	85	105	CLASS B ISO 6722	T2N	Heat Resistant(sheathing)	11
13.5	260	1.4	60	76	70	ST5 /IEC 1-60227	13.9	COVAXIAL	12
16	230	1.48	100	85	90	IEC 60502	LS.FR.OR.PVC ST2	Low Smoke&FlameRetardant&Oil Resistant	13
15	240	1.46	100	81	90	IEC 60502	OR.PVC ST2. UV	Oil Resistant	14
15	225	1.485	105	85	90	IEC 60502	LS.OR PVC ST2	Low smoke & Oil Resistant	15
15	220	1.51	110	88	90	IEC 60502	LS.FR.PVC ST2 UV	Low Smoke & FlameRetardant	16
15	220	1.51	110	85	90	IEC 60502	LS.ANTI ROD ST2 UV	Low Smoke & Anti Rodent	17
15	230	1.49	110	85	90	IEC 60502	LS.OR.ANTI ROD .PVCST2 UV	Low Smoke&Oil Resistant&Anti Rodent	18
10	140	1.68	65	80	80	IEC 60502	LS.FR.PVC- BD	Low Smoke&FlameRetardant-Bedding	19
14.5	225	1.475	75	82	80	IEC 60502	ST1 FR	FlameRetardant	20
10	140	1.68	65	80	80	IEC 60502	LS.FR.PVC- BD	Low Smoke&FlameRetardant-Bedding	21
4.5	225	1.475	75	82	80	IEC 60502	ST1 FR	FlameRetardant	22
.Attention:Ability to produce all the above products in different colors and with different mechanical properties according to customer needs									

WIRE & CABLE SHEATHING



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