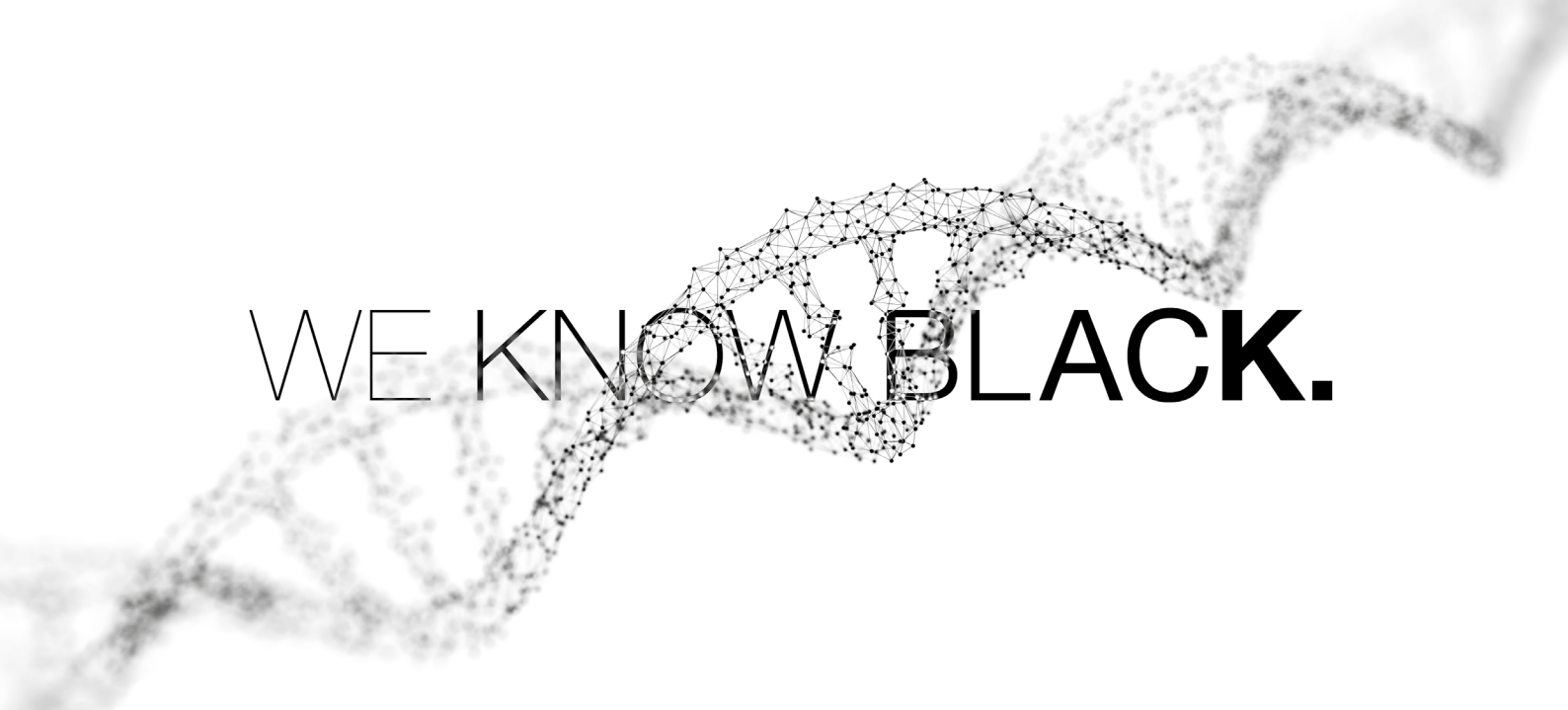

WE KNOW BLACK.

NOT ALL BLACKS ARE THE SAME

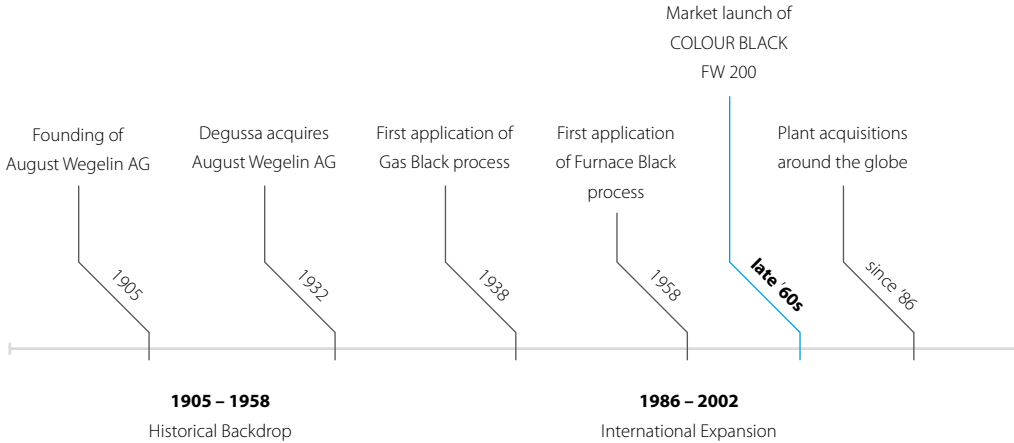
01

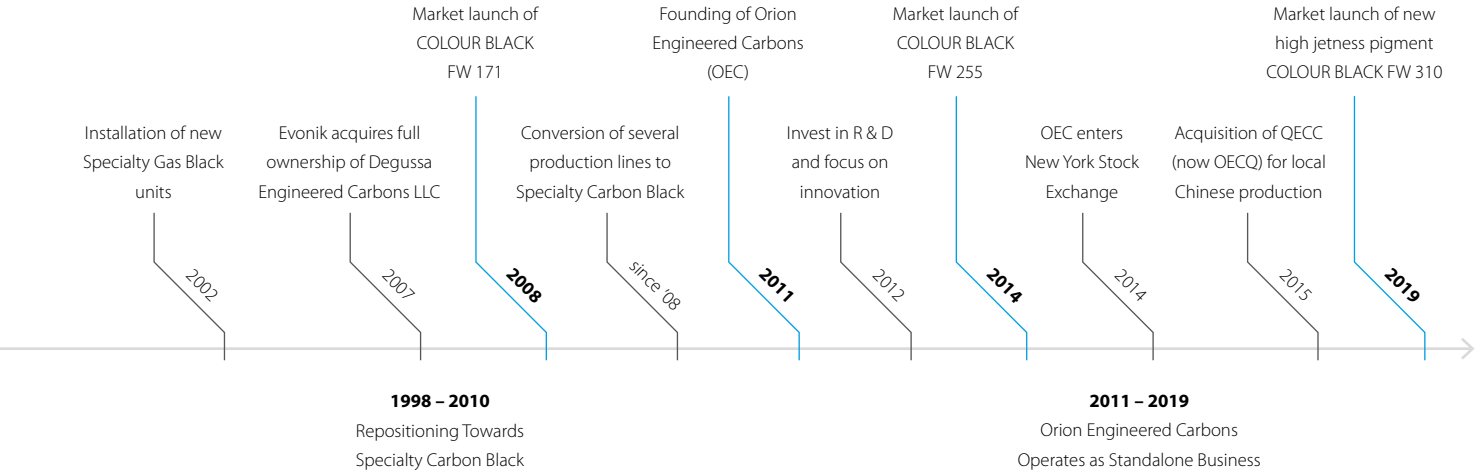
Nuances, variety and variance succeed only by the use of different blacks. We generate more than 280 Specialty Carbon Black grades using five manufacturing processes plus after treatments.

We know black.

FOCUSED 02

We have been helping to shape the Carbon Black materials market since the start of the 20th century. Our specialization in Specialty Carbon Black makes us a proficient partner due to our commitment to quality. Emerging from August Wegelin AG, the Degussa Group and Evonik, all Carbon Black expertise has been concentrated in Orion Engineered Carbons since 2011. This makes Orion Engineered Carbons number one in Specialty Carbon Black production. Our customers gain the benefits of this unique detailed knowledge.




Installation of new Specialty Gas Black units
2002
Evonik acquires full ownership of Degussa Engineered Carbons LLC
2007
Market launch of COLOUR BLACK FW 171
2008
Conversion of several production lines to Specialty Carbon Black
since '08
Founding of Orion Engineered Carbons (OEC)
2011
Invest in R & D and focus on innovation
2012
Market launch of COLOUR BLACK FW 255
2014
OEC enters New York Stock Exchange
2014
Acquisition of QECC (now OECQ) for local Chinese production
2015
Market launch of new high jetness pigment COLOUR BLACK FW 310
2019
1998 – 2010
Repositioning Towards Specialty Carbon Black
2011 – 2019
Orion Engineered Carbons Operates as Standalone Business

Short Facts

- Almost 125 years of innovation
- 14 plants, three regional headquarters, more than 1,400 employees
- Four technical centers – in Germany, USA, China and South Korea
- Only supplier with five Carbon Black production processes: Furnace Black, Gas Black, Lamp Black, Acetylene Black and Thermal Black
- Commercial presence in more than 90 countries
- Global capacity of more than 270 kt/yr for Specialty Carbon Black

Applications

We can provide solutions to any coatings application using Carbon Black. Get in touch with us to discuss your application and your needs.

We will find the optimum solution for you, as different applications have individual performance requirements:

- Automotive OEM
- Automotive Refinish
- Plastic Coatings
- Industrial Coatings
- Powder Coatings
- Coil Coatings
- Protective/Marine Coatings
- Architectural/Decorative Coatings

INNOVATIVE

Coating systems are complex. Our knowledge is not limited to our pigments. What effects do binders, additives, quality of dispersion, clear coats or film thickness have on shade and color strength? How do pigments and a recipe´s compounds impact the shade? We have precise knowledge of the chemistry and process-related properties of our products. Our primary focus is on the quality of our products and services, as well as the appropriate solution in each individual case.

We work with you to design the right black for you. Our large coatings laboratory and knowledgeable team can overcome the challenges facing our customers' adaptions and applications. We work together to drive enhancements and innovation forward. Our well-known product COLOUR BLACK FW 200 has been setting the market standard for black pigments for decades. But being state of the art is not enough for us; with COLOUR BLACK FW 255 introduced in 2014 and now our new product COLOUR BLACK FW 310, we are once again raising the bar for jetness.

A wide range of technologies, development expertise and profound knowledge of systems and effects of formulation changes – that is the "magic formula" for the perfect product for your individual needs.

RESPONSIVE

04

We listen carefully and achieve the best performance of our pigments in your coatings system. We are the perfect partner to accompany you on the path to your perfect application. Because we truly know black inside-out. We are more than just a pigment manufacturer.

We are a solution provider.

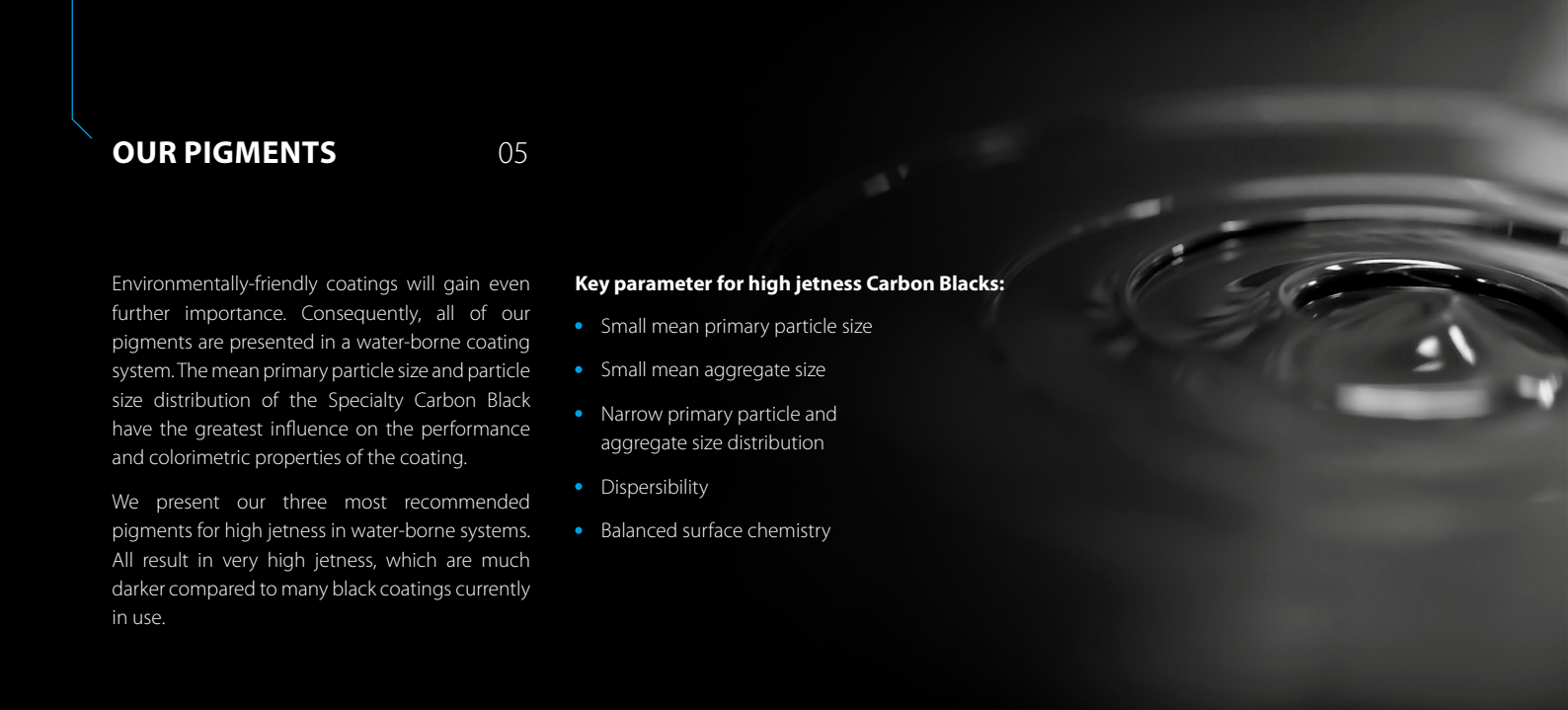
OUR PIGMENTS

Environmentally-friendly coatings will gain even further importance. Consequently, all of our pigments are presented in a water-borne coating system. The mean primary particle size and particle size distribution of the Specialty Carbon Black have the greatest influence on the performance and colorimetric properties of the coating.

We present our three most recommended pigments for high jetness in water-borne systems. All result in very high jetness, which are much darker compared to many black coatings currently in use.

Key parameter for high jetness Carbon Blacks:

- Small mean primary particle size
- Small mean aggregate size
- Narrow primary particle and aggregate size distribution
- Dispersibility
- Balanced surface chemistry



COLOUR BLACK FW 171

COLOUR BLACK FW 171 is an outstanding product for coloring high jetness black mass tone and metallic water-borne coating systems. Highest jetness levels combined with very strong bluish undertones, high gloss and low haze can be obtained.

The grade is recommended for all kinds of water-borne coating systems where a high jetness is required. COLOUR BLACK FW 171 improves the performance of high end industrial, plastic and automative OEM applications and shows excellent colorimetric properties in powder coatings.

Properties*

Jetness M_Y	307
Undertone dM	12.3
Volatile Matter at 950° [%]	2.0
BET [m^2/g]	600
Primary particle size [nm]	11
pH	8.0

* For definition of analytical test methods see chapter 06.

COLOUR **BLACK FW 255**

COLOUR BLACK FW 255 is an after-treated Specialty Carbon Black. The after-treatment proess generates a functional surface with oxygen-containing groups. When incorporated in a coating system, these groups induce better wetting and dispersing properties. An enhanced interaction with polar binders improves the stabilization of the Specialty Carbon Black significantly, resulting in very high jetness and a deep blue undertone. COLOUR BLACK FW 255, with its tailored and well-balanced properties, offers formulators a broad range of possibilities for high jet coatings – not only in automotive applications but also in all kinds of applications where highest jetness levels are required.

COLOUR BLACK FW 255 demonstrates superior properties and can be used both in solvent-borne and water-borne coating systems.

Properties*

Jetness M_Y	319
Undertone dM	11.4
Volatile Matter at 950° [%]	12.0
BET [m^2/g]	600
Primary particle size [nm]	11
pH	2.5

* For definition of analytical test methods see chapter 06.

COLOUR **BLACK FW 310**

With our new product COLOUR BLACK FW 310, we are again expanding our portfolio. We designed this pigment based on our experience with COLOUR BLACK FW 255. The after-treatment induces better wetting and dispersing properties for water and solvent-borne coatings.

This Carbon Black gives highest jetness values in combination with blue undertone for both solvent and water-borne coating systems. To achieve this, it is also essential to select the right additive for the coating system. Customers using COLOUR BLACK FW 310 can fulfill the requests of car manufacturers to achieve ultra-high jetness coatings with deep blue undertone, as well as offering options for metallic and effect coatings.

Properties*

Jetness M_Y	325
Undertone dM	8.7
Volatile Matter at 950° [%]	12.0
BET [m^2/g]	600
Primary particle size [nm]	11
pH	2.5

* For definition of analytical test methods see chapter 06.

IT DEPENDS: SUMMARY & CONCLUSION

06

Different requirements in terms of styling require different pigments to be selected for use. Not every pigment is equally suited to each application.

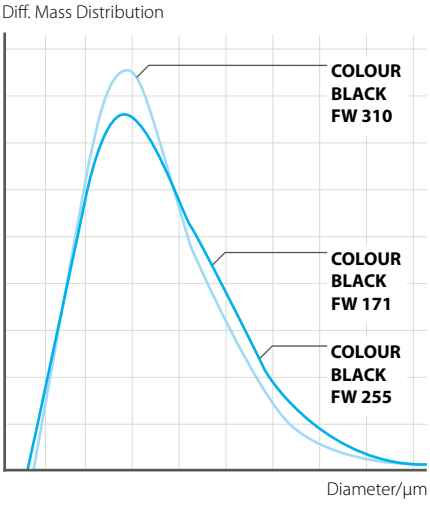
Due to the pigment itself and then depending on the additive, admixture or recipe, the color, flop and brilliance properties change. We support our customers in selecting the right pigment for their individual requirements. In our systematic tool you will find our three most recommended pigments for water-borne coating systems. Examples of the versatile application, in addition to the mass tone in white, include metallic and a pearl pigment mixture. Here, you can already see the color variance and diversity that is incorporated in the individual pigments. The coating examples contain an amount of 1.0 % (White Blend) or 1.5 % Carbon Black (Solid, Alu Blend, Blue Pearl).

Analytical test methods

Jetness M_Y	PA PI-AT-CS B004 D.04*
Undertone dM	PA PI-AT-CS B004 D.04*
Volatile Matter at 950°	DIN 53552
BET	ISO 4652
Primary particle size	TGZ3*
pH	ISO 787-9

* Internal test method (further information on request).

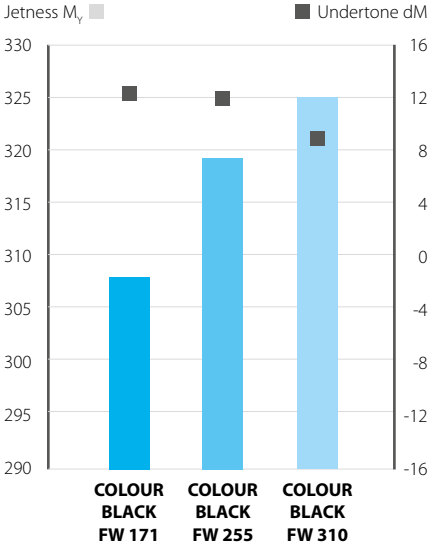
Aggregate size distribution

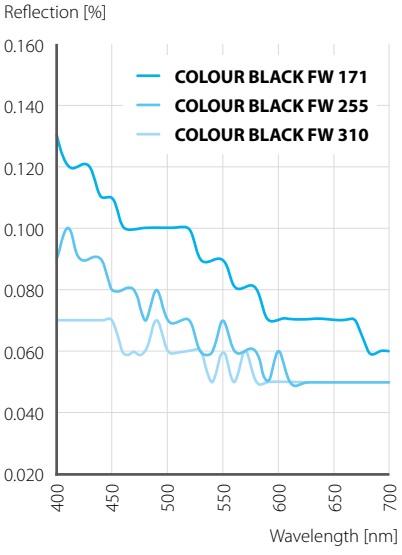


SOLID

All of our pigments open the possibility of a result with excellent color depth and jetness in the top range of over M_y 300. They all fulfill the highest requirements in terms of color depth and undertone. However, when comparing the pigments, obvious differences can be seen:

- The effect of COLOUR BLACK FW 171 is grayer and paler. It has less color depth than the other two pigments.
- The effect of COLOUR BLACK FW 255 is more reddish. It reaches the second highest jetness value.
- COLOUR BLACK FW 310 appears deeper and bluer than the other pigments based on the combination of highest jetness and a high bluish undertone.





WHITE BLEND

The White Blend has a ratio of 100 : 3 Titanium Dioxide to Carbon Black. Although the color depth of these pigments means that they are not the first choice for a white blend, the effects are convincing and make it possible to draw conclusions for metallic and effect coatings:

- Compared to the other grades, COLOUR BLACK FW 171 is bluer and darker with the highest color strength.
- In comparison, COLOUR BLACK FW 255 demonstrates the lowest color strength and is paler and more yellow than COLOUR BLACK FW 310.
- The effect of COLOUR BLACK FW 310 is redder, darker and bluer than COLOUR BLACK FW 255. It has a higher color strength than the other two pigments.

ALU BLEND

The Alu Blend has a ratio of 4 : 1.5 of aluminum flakes to Carbon Black. Not just the color but also the flop and brilliance are parameters that change via the pigment blends and make interesting options possible for styling work:

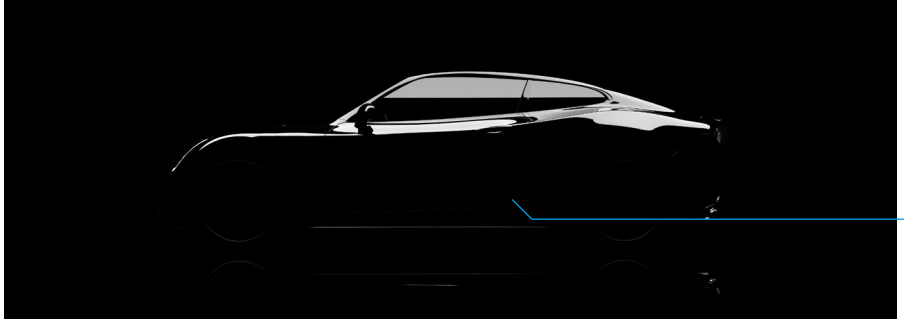
- COLOUR BLACK FW 171 has more color depth than the other two grades. The brilliant angle is darker, bluer and grayer.
- The effect of COLOUR BLACK FW 255 appears cooler and more metallic and stands out due to a stronger flop compared to the other two pigments. The brilliant angle is brighter, grayer and bluer.
- From all angles, the blend of COLOUR BLACK FW 310 appears more golden and shows a rather neutral flop than the other two pigments.

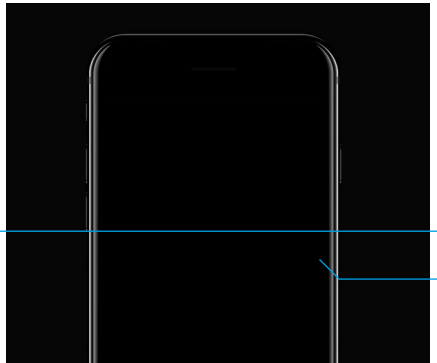
BLUE PEARL

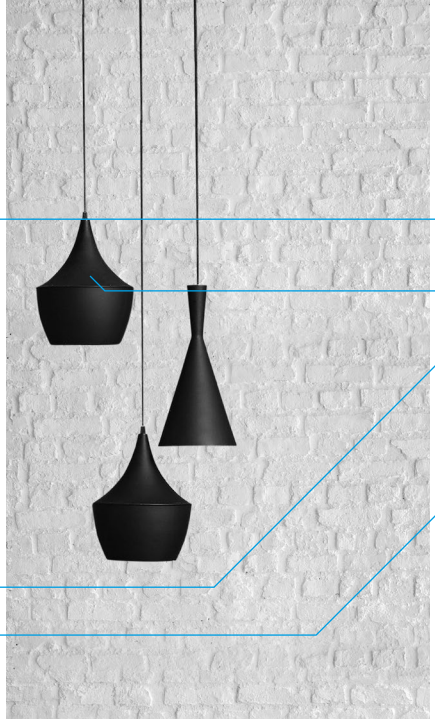
The styling of the effect-blacks demonstrates the unique benefits of the different pigments. An integrated coating process was used, taking the mass tone as the basis. The styling was designed with 0.06 % glass flakes in blue and transparent at a ratio of 1 : 1:

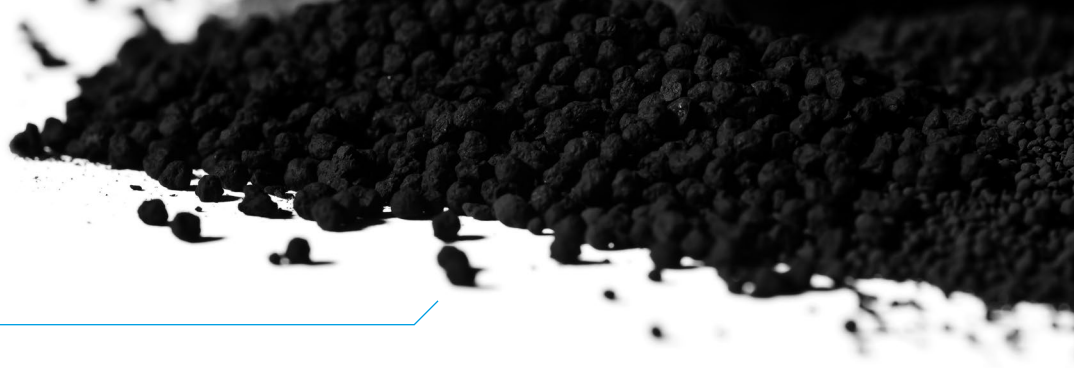
- The effect of COLOUR BLACK FW 171 is more yellowish and paler with a lack of color depth and purity.
- Compared to COLOUR BLACK FW 310, the effect of COLOUR BLACK FW 255 is somewhat redder and paler with a lower color depth.
- COLOUR BLACK FW 310 has the highest color intensity. This new product provides captivating depth and its effect is cleaner and clearer than the other COLOUR BLACKs.

	SOLID w/b	**WHITE BLEND** w/b	**ALU BLEND** w/b	**BLUE PEARL** w/b
COLOUR BLACK FW 171	HJT01	HJT02	HJT03	HJT04
COLOUR BLACK FW 255	HJT05	HJT06	HJT07	HJT08
COLOUR BLACK FW 310	HJT09	HJT10	HJT11	HJT12









TECHNICAL INFORMATION

For detailed information regarding technical properties of our three most recommended pigments, you can download the related technical information under the following URL:

https://www.orioncarbons.com/colour_black_tis

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