ACTIVATED CARBON
FOR AUTOMOTIVE APPLICATIONS
Today's highly regulated auto industry involves rigorous emissions regulations and efficient removal of gaseous pollutants from outside air. Auto makers must meet these demands while producing vehicles that meet consumers' price expectations. Our activated carbon plays very important roles in two applications:

- Evaporative emission control
- Cabin air filters

For managing evaporative fuel emissions, our product portfolio consists of activated carbon options that can meet all of the most stringent evaporative emission control requirements. Our products feature a range of butane and gasoline working capacity for any design consideration. What's more, the superior aging performance of our activated carbon ensures a stable and reliable working capacity for the life of the vehicle.

For cabin air, our specially selected granular activated carbon (GAC) features a small particle size that is optimized for the adsorption of the gaseous pollutants and high removal efficiency.

### EVAPORATIVE EMISSION CONTROL CANISTERS

Automotive emissions are a major contributor to urban air pollution. Exhaust emissions are effectively controlled using exhaust gas catalysts. However, for controlling evaporative fuel emissions, activated carbon is the most common technology worldwide. In all gasoline vehicles, the control of evaporative fuel emissions is of major importance.

Automotive evaporative emission control of gasoline vapors is comprised of two primary categories; **diurnal bleed control** and **onboard refueling vapor recovery** (ORVR). Although the regulations can vary by global region, the purpose is the same – capture volatile gasoline vapors before they enter the atmosphere. This is done with evaporative loss control devices (ELCD) attached to the fuel tank that consist of a canister that contains activated carbon to adsorb the hydrocarbon vapors.

#### Diurnal bleed control

Gasoline vapors from the fuel tank consist of a mixture of hydrocarbons. Under ambient conditions, especially during hot summer temperatures, the more volatile, light weight vapors that are evaporated need to be vented from the fuel tank to prevent over pressurizing the tank. The vapors are vented into the canister that is packed with activated carbon (Figure 1). Under these conditions, the loading rate is slow and only a few grams per hour. The activated carbon effectively captures these vapors before they can escape into the atmosphere.

![Figure 1](image-url)

**Onboard refueling vapor recovery**

During refueling, a mixture of light and heavy gasoline vapors is generated within the fuel tank. Depending on regional regulations, the capture of these vapors is either done on-board through the vehicle's ELCD activated carbon canister or they are vented back through the refueling system and captured locally by the refueling station (Figure 2). For on-board capture, the activated carbon canister must adsorb the hydrocarbon vapors quickly, upwards of 60 grams per minute.
Activated carbons must not only adsorb high-levels of volatile hydrocarbons but also desorb a large quantity of the hydrocarbons during purging. When the vehicle is running, a portion of fresh air flows backwards through the activated carbon bed purging the carbon by desorbing the gasoline hydrocarbons from the carbon bed. The purge air and hydrocarbon mixture is then fed to the intake manifold as part of the fuel intake. In this way, the activated carbon is regenerated allowing activated carbon to control evaporative emissions for the life of the vehicle. The difference between the gasoline adsorption capacity and the retained gasoline after purging is the Gasoline Working Capacity (GWC).

**Our Pelletized Activated Carbon Portfolio**

Our main products for evaporative emission control applications are pelletized activated carbons. These carbons offer optimal particle size in relation to pressure drop, hardness, density, and flow characteristics. This is especially important for increasing canister volumes to capture more vapor and to promote sufficient air flow for purging in your canister design.

### Product portfolio

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORIT® CNR115</td>
<td>Standard extruded chemically activated carbon, specifically designed for gasoline vapor capture</td>
</tr>
<tr>
<td>NORIT CNR120</td>
<td>Gasoline vapor capture extrudate that offers a unique set of properties over the alternatives; enhanced on-board refueling vapor recovery (ORVR) GWC, improved purge efficiency, and lower bleed</td>
</tr>
<tr>
<td>NORIT CNR150</td>
<td>High-capacity gasoline vapor capture product extrudate specifically designed for on-board refueling vapor recovery (ORVR) systems to meet stringent regulatory requirements in Asia and North America</td>
</tr>
<tr>
<td>HONEYCOMB</td>
<td>Next generation honeycomb scrubbers designed specifically to lower bleed emissions to meet increasingly stringent regulatory requirements in Asia and North America</td>
</tr>
</tbody>
</table>

### Diurnal GWC Aging

NORIT CNR120 has 10% higher diurnal working capacity over the competitive BWC-11, while NORIT CNR150 is equivalent to the competitive BWC-15

### ORVR GWC Aging

NORIT CNR120 activated carbon has a 20% higher ORVR compared to the competitive BWC-11 carbon, enabling a high capacity, lower bleed carbon for ORVR applications

<table>
<thead>
<tr>
<th>Carbon</th>
<th>ASTM-BWC (g/L)</th>
<th>EPA-BWC (g/L)</th>
<th>Diurnal GWC (g/L) at 40 g/hr loading</th>
<th>ORVR GWC (g/L) at 40 g/min loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORIT CNR120</td>
<td>12</td>
<td>54</td>
<td>41</td>
<td>39</td>
</tr>
<tr>
<td>Competitive BWC-11</td>
<td>11</td>
<td>50</td>
<td>37</td>
<td>33</td>
</tr>
<tr>
<td>NORIT CNR150</td>
<td>15</td>
<td>55</td>
<td>44</td>
<td>38</td>
</tr>
<tr>
<td>Competitive BWC-15</td>
<td>16</td>
<td>55</td>
<td>45</td>
<td>39</td>
</tr>
</tbody>
</table>
CABIN AIR FILTERS

Activated carbon plays a vital role in the adsorption of gaseous pollutants from outside air that may carry unpleasant smells and harmful substances. Cabin air filters adsorb those gases with specially selected granular activated carbon (GAC) with a small particle size. Our activated carbon is optimized to enhance the adsorption of the gaseous pollutants and to ensure high removal efficiencies.

<table>
<thead>
<tr>
<th>Product name</th>
<th>Product description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORIT GCN 3070</td>
<td>A coconut shell-based granular activated carbon</td>
</tr>
</tbody>
</table>

APPLICATION SUPPORT

Ongoing technical support is always close at hand at Cabot. By applying our knowledge and expertise, you’ll get the best fit for your application. We call our commitment to serving your activated carbon needs a partnership.

If you have any questions or would like to obtain the following information, contact your nearest Cabot office:

1. An analysis of your activated carbon needs
2. Technical bulletins
3. Test information
4. Norit standard test methods (NSTM)
5. Specific application information
6. General information on activated carbon
7. Product information
8. Samples for testing

AHEAD OF THE CURVE ON PURIFICATION

Building on our 100-year history of innovation in manufacturing and product development, Cabot Norit Activated Carbon is the world’s most experienced and one of the largest producers of activated carbon serving customers in more than 100 countries around the world with manufacturing facilities in seven countries. Our products are used to remove pollutants, contaminants and other impurities from water, air, food and beverages, pharmaceutical products and other liquids and gases efficiently and cost effectively. We have created more than 150 different grades of activated carbon – produced from a variety of raw materials – so our customers get precise solutions for their specific applications. Additionally, we offer a full range of activated carbon services including rental systems, carbon reactivation, bulk delivery and change-out, carbon evaluation and direct technical support to insure the right product solution every time.

Our sales, technical service and customer service teams are prepared to serve customers around the world. Contact us at cabotcorp.com/activatedcarboncontact

The data and conclusions contained herein are based on work believed to be reliable, however, Cabot cannot and does not guarantee that similar results and/or conclusions will be obtained by others. This information is provided as a convenience and for informational purposes only. No guarantee or warranty as to this information, or any product to which it relates, is given or implied. This information may contain inaccuracies, errors or omissions and CABOT DISCLAIMS ALL WARRANTIES EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AS TO (i) SUCH INFORMATION, (ii) ANY PRODUCT OR (iii) INTELLECTUAL PROPERTY INFRINGEMENT. In no event is Cabot responsible for, and Cabot does not accept and hereby disclaims liability for, any damages whatsoever in connection with the use of or reliance on this information or any product to which it relates.

The NORIT name is a registered trademark of Cabot Corporation or its subsidiary. ©2018 Cabot Corporation. All rights reserved worldwide.