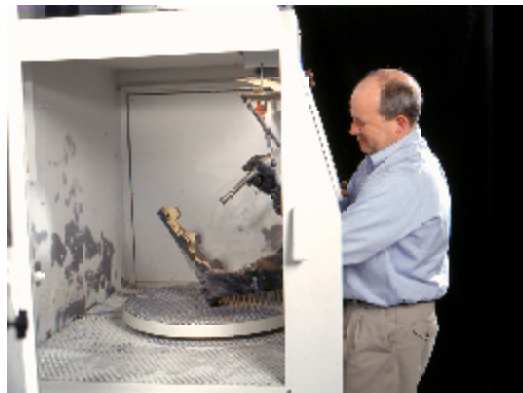




### Cleaning Automotive Parts with Baking Soda

#### Overview of the Technology

**Baking soda (sodium bicarbonate) is a softblast media that is ideal for sensitive substrates where metal removal is not acceptable. Baking soda blasting is highly effective at removing paint, carbon, dirt, gaskets, grease and oil. Baking soda is not effective at removing rust.**



The baking soda process can be used with or without water. The water serves as a dust suppressant and the hydraulic action of a wet system can improve cleaning of grease and oil.

Since baking soda does not harm the part, masking is not necessary. Baking soda blast cleaning may not always produce a “like-new” finish on parts in the way that steel shot and glass bead blasting do. If a like-new finish is required, and a more aggressive process can be tolerated, a blended formulation of baking soda and aluminum oxide can be used. A baking soda/aluminum oxide media can also be effective at removing rust.

Baking soda blasting is a “one-pass” operation. The media cannot be recycled for multiple passes because the particles fractionate when they impact the part and are no longer effective for cleaning. This attribute is disadvantageous from a cost standpoint. However, a distinct advantage of a one-pass blasting system is that heavily soiled parts can be blasted without concern for maintaining the cleanliness of the media.

Pre-washing of parts coated with very heavy grease and oil may reduce the cycle time of baking soda blast cleaning.

#### How it Works

In a dry system, compressed air delivers sodium bicarbonate media from a pressure pot to a nozzle. The soda impacts the coated surface and removes contaminants from the part.

In the wet process, the media mixes with a stream of water at the nozzle. The water dissipates the heat generated by the abrasive process, reduces the amount of dust in the air, and assists in the contaminant removal by hydraulic action.

The effectiveness of sodium bicarbonate cleaning depends on optimizing a number of operating parameters, including nozzle pressure, standoff distance, angle of impingement, flow rate, water pressure, and traverse speed.

#### Advantages of Technology:

- Will not erode metal surfaces
- Prewashing and masking are not required in most applications
- No size limitations for parts being stripped
- May not require rinsing

#### Disadvantages:

- Baking soda cannot be recycled; it is a one-pass system
- Noise level is high



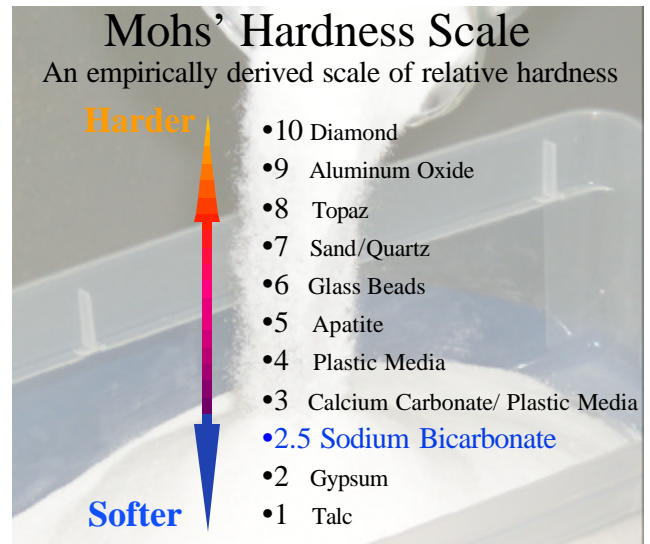
This fact sheet has been prepared under a grant from the New York State Energy Research and Development Authority (NYSERDA). Under this grant, RIT has identified cleaning technologies for automotive parts remanufacturers that are energy-efficient, cost-effective, and environmentally friendly.

# Surface Cleaning

## Configuration of Equipment

Three types of sodium bicarbonate systems are available – dry cabinet, wet/dry cabinet, and portable wet/dry. Dry and wet/dry cabinet systems are fully enclosed glovebox units with full media and contaminant containment provided by vacuum-driven waste and dust collection equipment. Cabinet systems consist of: (1) a pressure vessel to hold and deliver the media through a hose, (2) a glove box with hose and nozzle, and (3) a waste/dust collection system. These systems require a source of compressed air (8 to 10 cfm for a small unit).

Portable, uncontained systems are typically used for outdoor cleaning of large surfaces like cars or buildings. Portable systems can be either electric or gas powered.



## Environmental Health and Safety

Use of sodium bicarbonate in its dry form can create a cloud of dust. While the baking soda itself is not toxic, the airborne particulates can contain toxic elements from the contaminants being removed. Therefore, the cleaning process should be performed in an enclosed area such as a cabinet or booth. Use of shrouding and/or water should be used in outdoor blasting applications to contain dust. Baking soda blasting equipment can be noisy; hearing protection should be worn. Soundproofing blast equipment or locating equipment in a remote area can help to reduce noise levels in a manufacturing facility.

## Cost of Equipment

Larger, powerful dry cabinets range in cost from \$10,000 to \$20,000 depending on the size of the pressure vessel and cabinet. Smaller dry, tabletop units can cost between \$1,000 to \$3,000. Smaller units typically deliver less media per minute and have a smaller blast pattern, thereby covering less area per minute of operation.

Wet/dry cabinet systems offer more versatility but are more expensive, approximately \$50,000 per unit.

## No More Masking!

An engine remanufacturer currently spends 4 hours to clean 50 intake valves (that's almost 5 minutes per valve). Roughly half of this time is spent masking the valve stems before they are cleaned in a glass bead blaster. If the stems are not masked, they would be pitted by the glass bead.

NCR<sup>3</sup> tried baking soda blasting. It took between 45 seconds to 1 minute total to clean a single valve. Since the baking soda will not harm the valve stem, no masking is required. The engine remanufacturer inspected the valves and thought they were acceptable.

### Here's a cost comparison:

	Masking and Bead Blasting <sup>1</sup> (\$/part)	Baking Soda <sup>2</sup> (\$/part)
Energy	\$0.05	\$0.03
Labor <sup>3</sup>	\$0.95	\$0.18
Media	\$0.38	\$0.44
<b>Total<sup>4</sup></b>	<b>\$1.38</b>	<b>\$0.65</b>

#### Notes:

1. Based on glass bead cost of \$0.47/lb, 3 passes
2. Based on baking soda cost of \$.50/lb
3. Based on fully-loaded labor rate of \$12/hr
4. Rounded to nearest penny

## Waste Management

The solid waste from a dry system may be suitable for disposal in a sanitary landfill. Analysis of waste solids is required prior to disposal. NCR<sup>3</sup> conducted analytical testing (i.e., TCLP) of spent baking soda media used to clean carburetors. The waste did not exhibit any characteristics of hazardous waste - toxicity, reactivity, ignitability, and/or corrosivity. The sample was not considered to be hazardous and could therefore be safely and legally disposed of as non-hazardous waste.

In a wet system, solid residue from the wastewater can be separated by settling or filtration. Filtered wastewater containing dissolved sodium bicarbonate may be treated at an industrial wastewater treatment plant. Analysis of wastewater is required prior to discharge.

## How it Performs

The following table presents a snapshot of tests performed at NCR<sup>3</sup> using baking soda to clean automotive parts. Testing was performed using an ARMEX Accustrip cabinet, DS Series, 11SX model with a round ¼ inch nozzle (an Armex No. 4 Performance Nozzle) and Armex Flow M media. The table contains information on parts cleaned, test conditions and results.

# Surface Cleaning

## The Bottom Line

### Baking soda blasting could be for you, if...

- ☑ You want to remove paint, carbon, and gaskets
- ☑ You are cleaning a “soft” metal, plastic, ceramic or other sensitive material
- ☑ You would like to blast a part but are concerned about media getting trapped
- ☑ You are using a time and labor-intensive manual process to remove a tough contaminant
- ☑ One or more of the above apply and you are trying to replace a hazardous process

### Baking soda blasting is probably not for you, if...

- ☑ You want it to remove rust, scale, heavy grease or heavy oil
- ☑ You want it to clean very small parts

## Where to get more information

Contact NCR<sup>3</sup> or the following vendors of baking soda cleaning systems.

ARMEX

E.S.C.A Industries, LTD

Evans Products, Inc.

[www.armex.com](http://www.armex.com)

[ESCAIND@aol.com](mailto:ESCAIND@aol.com)

[www.evansproducts.com](http://www.evansproducts.com)

Part Information					Cleaning Data				Cost (\$/part)			
Part	Component	Materials of Construction	Contaminants	Level of Contaminant	Pre-cleaning	psi/cfm	Cycle Time	Results	Media <sup>1</sup>	Energy <sup>2</sup>	Labor <sup>3</sup>	Total
Intake Valve	Engine, Cylinder Head	Steel	Carbon	High	none	75/80	45 sec - 1 min.	very clean	\$0.44	\$0.03	\$0.18	<b>\$0.65</b>
			Grease	Medium								
			Dirt	Medium								
Housing	Heavy Duty Fuel Injector (12"x10"x5")	Aluminum, Brass	Oil	High	Enzymatic Cleaning	75/80	4 min.	excellent	\$2.00	\$0.14	\$0.80	<b>\$2.94</b> <sup>4</sup>
			Carbon	Medium								
			Grease	Medium								
Pump Housing	Fuel Pump, Heavy Duty (5"x3"x1.6")	Aluminum, Copper	Grease	Medium	none	50/57	3 min.	adequately clean	\$1.50	\$0.09	\$0.60	<b>\$2.19</b>
			Dirt	Medium								
			Paint	Medium								
			Gasket	Medium								
Throttle Body	Carburetor	Aluminum, Zinc	Grease	Medium	none	75/80	1-2 min.	very clean	\$0.75	\$0.06	\$0.30	<b>\$1.11</b>
			Gasket	Medium								
			Oxidation	Medium								

### Notes:

1. Based on media consumption rate of 1lb/min and cost of \$0.5/lb
2. Assume 90% efficiency of compressor and average electricity cost of \$0.10/kwh
3. Based on fully loaded wage rate of \$12/hr.
4. Total cost represents baking soda only-does not include pre-cleaning cost of enzymatic cleaning.



# Surface Cleaning

## *ABOUT NCR<sup>3</sup>:*



The National Center for Remanufacturing and Resource Recovery (NCR<sup>3</sup>) at Rochester Institute of Technology provides technical assistance and applied research and development to industry and government agencies interested in remanufacturing and resource recovery techniques. We provide solutions that are both economically and environmentally sound.

NCR<sup>3</sup> has proven its ability to deliver concrete solutions for the remanufacturing industry since 1991. NCR<sup>3</sup> was formed as a collaborative effort of RIT's College of Engineering, the remanufacturing industry and several federal laboratories. Funding is provided by federal and state governments and private industry.



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