



## Acoustic Foams

### BETAFOAM™ acoustic foams

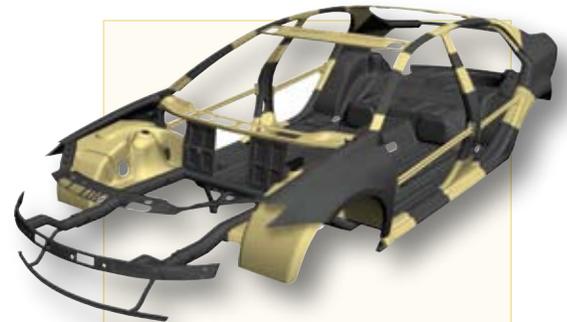
BETAFOAM™ ACOUSTIC FOAMS PROVIDE HIGHLY EFFECTIVE PROTECTION AGAINST AIRBORNE NOISE, IMPROVING OVERALL VEHICLE ACOUSTIC PERFORMANCE.

Part of a growing portfolio of acoustic solutions from Dow Automotive Systems, BETAFOAM low-density formulations form high-performance acoustical seals to prevent noise from resonating in vehicle cavities. The two-component polyurethane foam consists of a low-MDI prepolymer that reacts with a polyol blend that serves as an acoustic cavity-sealing and blocking foam.

#### Product benefits

- Cost- and mass-efficient solutions compared with traditional approaches
- Three-dimensional cavity sealing
- High expansion rate
- Prevent water leaks and gas intrusion

- Reduce wind, road, engine and tire noise
- Significantly reduce parts inventory with bulk solution compared to part offerings
- Design flexibility due to foam filling any cavity and contour, and no redesign required after sheet metal changes
- Eliminate tooling costs
- Low-MDI formulations may relieve ventilation requirements and ease operations in assembly
- Demonstrated performance in vehicles with 10-year durability and corrosion testing

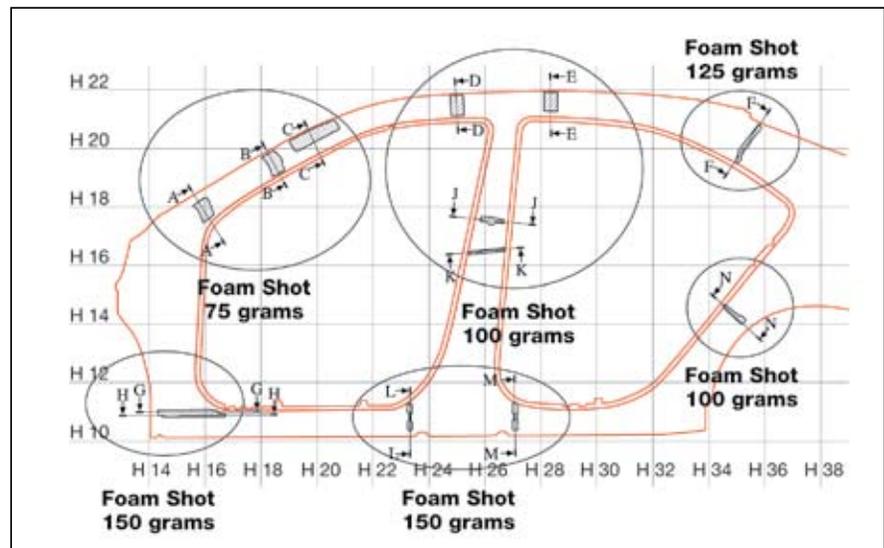


Typical BETAFOAM application areas.

#### Applications

BETAFOAM can be used wherever noise management can enhance the quality and appeal of the vehicle, including cowl bars, A/B/C pillars, roof joints, rockers, wheel wells, and sail panels.

#### Typical Vehicle Bulk Foam Shot Matrix



As a polyurethanes technology and market leader, Dow Automotive Systems offers best-in-class low-emission formulas and materials with renewable content and flexible processability. Material and NVH technology expertise helps us predict and deliver high-quality solutions.

### Sustainable solution

BETAFOAM™ Renue from Dow Automotive Systems, made with 25 percent renewable-based material, provides improved acoustical performance of one to five decibels (dB) at the driver's ear, and minimizes resonance build-up while sealing vehicle cavities. The lightweight foams create a potential mass savings of up to 30 percent versus previous generations of BETAFOAM.

### Proven performance

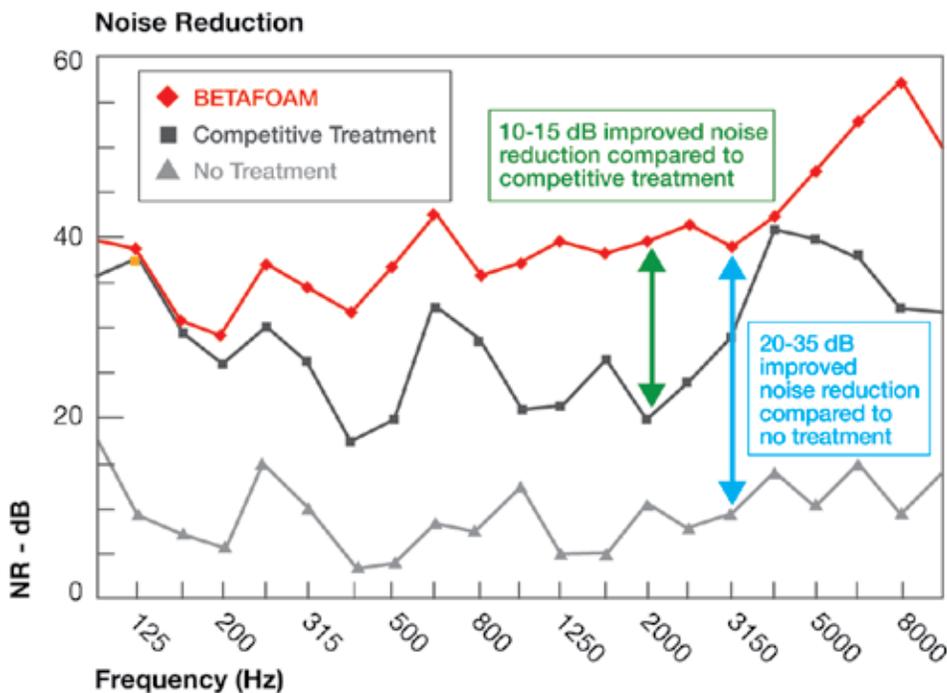
BETAFOAM acoustic foam is used today by many global OEMs in acoustic, air and water seal systems, and for baffle replacement in a wide range of vehicle types. It has demonstrated many performance and economic benefits, including:

- Improved NVH performance on production of high-end, award-winning vehicles
- Exceptional body leak test results, reproducibility, reliability and cavity-blocking performance compared to baffles
- Corrosion performance in durability testing
- Lower total cost compared to other cavity-sealing technologies for numerous production platforms over several years with initial equipment investment

### Engineering methodology

BETAFOAM acoustic foam performance is verified by ACOUSTOMIZE™ methodology, created by Dow Automotive Systems to evaluate and optimize the NVH performance of a vehicle to the driver's ear. It enables us to develop robust sound packages for OEMs and tier suppliers. ACOUSTOMIZE studies have demonstrated a component noise reduction (NR) improvement of five to 20 dB in applications using BETAFOAM compared to competitive treatments and designs.

### BETAFOAM™ Noise Reduction in Vehicle Body in White Demonstrated with ACOUSTOMIZE



Example of single-location NR improvement comparing NVH options.

### Sample test results

BETAFOAM™ was used as an acoustic, air and water seal, replacing baffles on a mid-size luxury vehicle. To benchmark cavity-sealing performance, a body leak test measured the airflow rate exiting cavities under given air pressures. BETAFOAM clearly provided excellent cavity-blocking performance compared to baffles, per the following average cubic feet per minute (cfm) body-in-white test results.

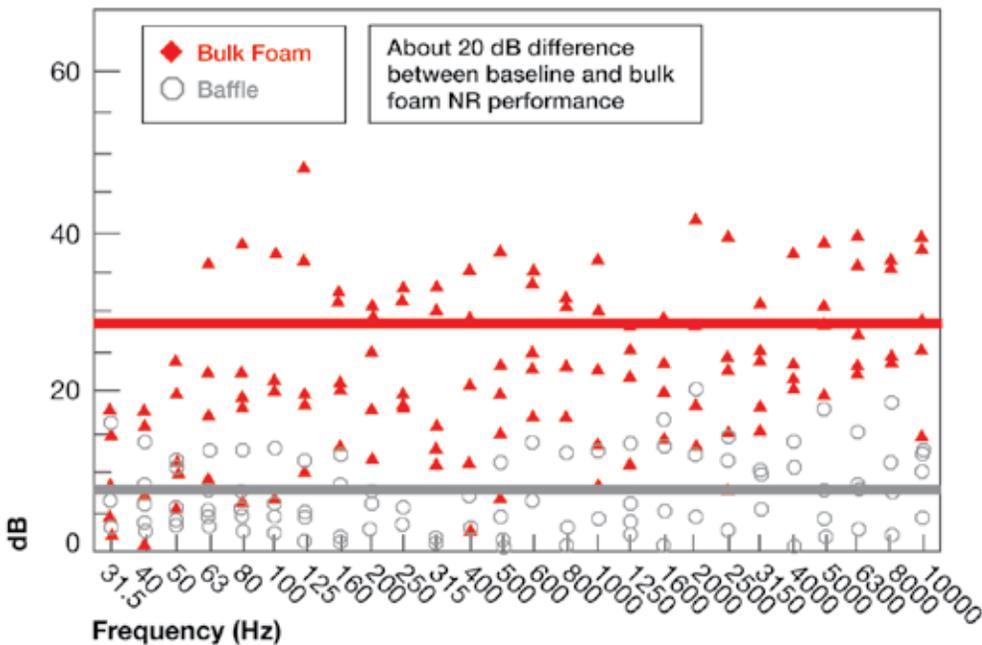
- Baseline performance: ~115 cfm
- Performance with baffles: ~97 cfm
- Customer target: < 30 cfm
- Performance with BETAFOAM: < 15 cfm

### Sealing Repeatability Study

| Material | Mean     | Standard Deviation |
|----------|----------|--------------------|
| Baffles  | 34.2 cfm | 9.06 cfm           |
| BETAFOAM | 3.0 cfm  | 1.57 cfm           |

*Note: 25 vehicles were tested using body leak testing procedures at the A-pillar. BETAFOAM™ showed significantly improved sealing properties with less variation compared to baffles.*

### Baseline and Bulk Foam NR Performance



*Average NR improvement for all locations within the vehicle.*

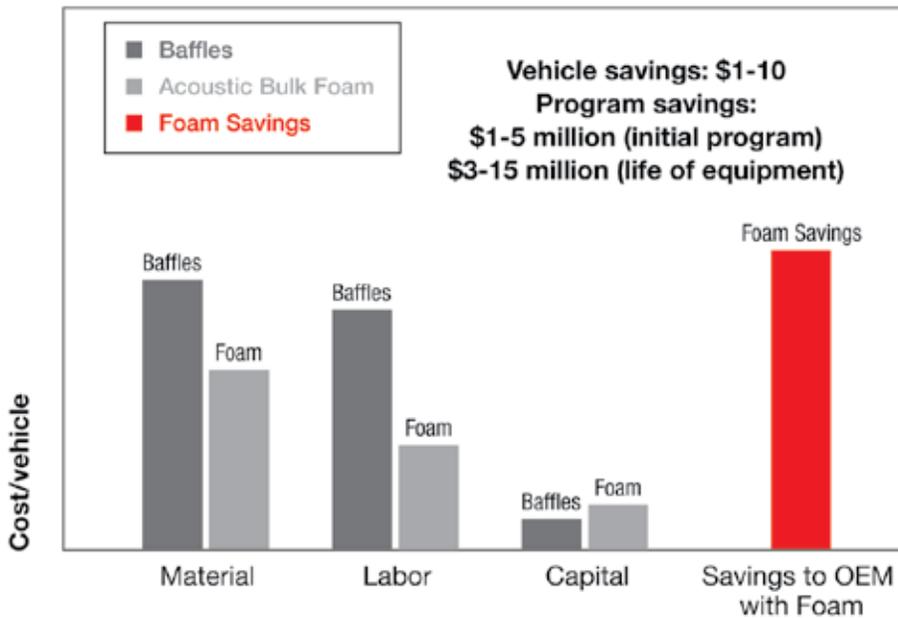
## Business case studies

Business case studies comparing the cost of using traditional cavity-sealing materials and BETAFOAM™ have been completed for several vehicle programs. Variables evaluated include material cost, labor and capital investment over the life of the first vehicle program, as well as subsequent programs that can be manufactured with the same initial equipment investment.

Existing vehicle production facilities have used foam equipment for 10 to 15 years with minimal annual maintenance costs. Savings of \$1 million to \$5 million are possible for the first program using foam for cavity sealing, particularly when robotic application is used. Foam equipment can be used in a plant for multiple platforms running concurrently in production, as well as over several vehicle plat-

form cycles at a facility. These studies confirm BETAFOAM is a cost- and mass-efficient solution compared to traditional approaches.

## Baseline and Bulk Foam NR Performance



## ABOUT DOW AUTOMOTIVE SYSTEMS

Dow Automotive Systems, a business unit of The Dow Chemical Company, is a leading global provider of collaborative solutions and advanced materials for original equipment manufacturers, tier suppliers, aftermarket customers and commercial transportation manufacturers. Our materials focus includes structural, elastic and rubber-to-substrate adhesive solutions; polyurethane foams and acoustical management solutions; films; fluids; and innovative composite technologies. Offices and application development centers are located around the world to ensure regionalized technical, engineering and commercial support for customers and industry groups. For additional information, visit [dowautomotivesystems.com](http://dowautomotivesystems.com).

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