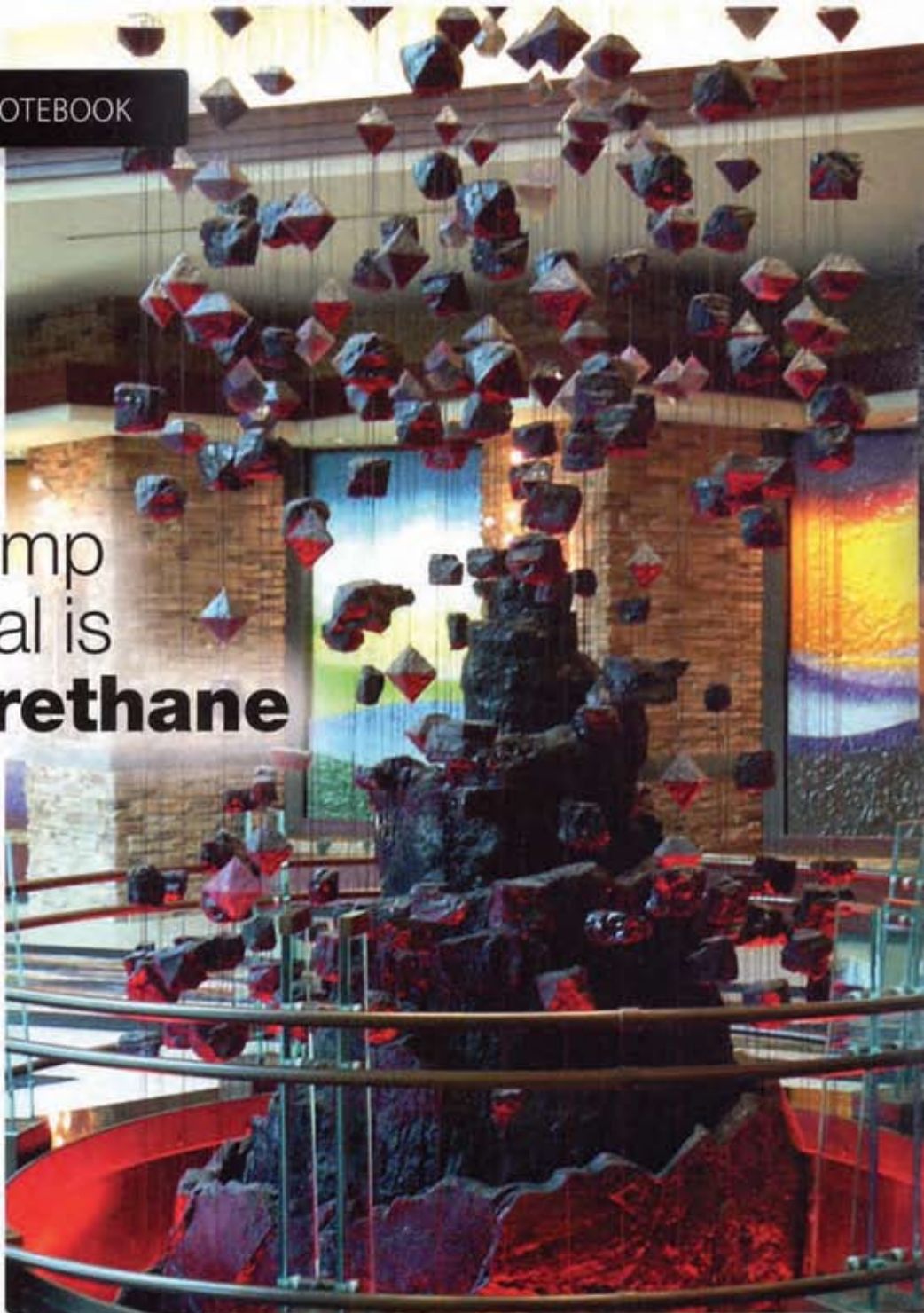


## This lump of coal is polyurethane

Gerhard Baut's "Coal to Diamonds" sculpture in Mohegan Sun at Pocono Downs Casino in Wilkes Barre, Pa., uses over 1,000 lb of cast polyurethane. Cables suspend 550 coal and diamond shapes from the 20-ft ceiling.



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When you think of artistic sculpture, coal and polyurethane may not be the first materials that come to mind. But that's not how Gerhard Baut, Artistic Director of **Baut Studios**, Swoyersville, Pa., sees it.

For the \$208 million, 300,000-sq-ft Mohegan Sun at Pocono Downs Casino in Wilkes Barre, Pa., Baut created a 20-ft-tall sculpture inspired by the variety of coal forms and surfaces found in northeastern Pennsylvania mines. He designed a coal base representing geologically different coals, going from fossilized soft coal and

peat to bituminous and hard anthracite. Above the base, lumps of coal transition into diamonds suspended from the ceiling.

To realize this vision, Baut used mercury-free polyurethanes from **Innovative Polymers**, St. John. Polyurethanes included high-strength, high-flexural-modulus IE-3075 and rapid-casting, water-clear RC-72DC. The materials' handling qualities let the artists replicate varied coal surfaces and hand-form individual cast pieces over a substructure.

Baut explains, "We found that the



Workers covered a rigid aluminum-and-wood frame with polyurethane foam. Next, they molded semicured polyurethane casts to the structure and clamped them there. Black polyurethane glue finally bonded the casts to the structure.

polyurethanes could be bent and shaped using techniques I learned as a glassblower.”

Under Baut's direction, craftsmen built nearly 100 different silicone-rubber molds from large, locally mined pieces of coal. The coal's sulfur content meant workers had to make molds from a tin-catalyzed silicone rubber. However, rigid polyurethanes chosen for the sculpture needed to be cast in platinum-catalyzed silicone rubber molds to permit easy demolding without release agents that could compromise the bond between the polyurethane and substructure.

Workers made intermediate tooling by lining the patterns with foundry wax, and cast platinum-catalyzed silicone molds from the wax forms. Each mold was used several times to create rigid polyurethane parts, most of them 4 x 4 ft x 1/2-in. thick and weighing between 25 and 30 lb.

Forming parts of that size while keeping the curing reaction from generating excess heat was another challenge. The large

polyurethane pieces also had to be malleable enough at demolding to let workers reform them on the sculpture, yet tough enough to maintain the intricate coal-like patterns on their surfaces.

The IE-3075 polyurethane's 420,000-psi flexural modulus and 10,500-psi tensile strength contributed to the sculpture's ultimate durability.

To form each polyurethane piece, craftsmen began by warming mold surfaces with heat lamps, which cut demold times and prevented shrink marks on cast surfaces. During the cure, fans held part temperature below 300°F to keep the exotherm, heat generated by the curing reaction, from overheating the part or creating a hazard. Finished castings had few defects, even when the polymer was exposed to varied ambient temperatures and humidities.

As soon as each coal-like slab attained green strength, workers wearing heavy, heat-resistant gloves demolded it and carried it to the sculpture. There, they

formed the interlocking parts over the substructure, an aluminum and plywood support covered with squares of flame-retardant, 10-lb/ft<sup>3</sup>, open-cell polyurethane foam. Workers clamped the polyurethane slabs in place until the parts were fully cured.

To complete each section of the base, workers gently pulled cured slabs away from the foam subsurface and joined them to the substrate with black-pigmented polyurethane adhesive. The foam's coefficient of thermal expansion (CTE) is comparable to that of the slabs, helping ensure a durable bond. In all, the base holds about 1,000 lb of polyurethane.

The "diamonds" of the sculpture are RC-72DC ultraclear polyurethane cast into silicone molds. Workers incorporated varying amounts and types of pigment as well as reflective powders to get, diamondlike tetrahedrons ranging from opaque black to clear and glittering. Tight cure-cycle control prevented exotherm and shrinkage on the 3-lb parts. **MD**