DiffuseReflections

The Newsletter for Progressive Acoustics Research

Volume 3, Issue 1, 1997

Introducing the OptiCurve™: a new optimized curved surface from RPG, acoustically designed and manufactured specifically for your project.

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"Closest to my heart is our new surface optimization capability, which allows us to custom tailor scattering surfaces to meet the acoustical coverage needs of the consultant and the aesthetic desires of the architect."

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DIFFUSE NEWS

Dr. Peter D'Antonio
President/CEO

WELCOME BACK!

My goal this year is to improve communication with the acoustical consulting community. RPG is literally exploding with significant developments in materials research, software, surface optimization, acoustical research, new products and new designs. Because there is so much information to disseminate, we have decided to try to interact with consultants in four ways. First, we have revamped our Diffuse Reflections Newsletter and will publish it quarterly; secondly, we have launched our web page for timely information about products, applications, project profiles, customer support, news and the RPG University, which houses a library, a research lab, a chat room and much more; thirdly, Troy Jensen and I hope to be visiting you for face to face discussions, case studies and software demonstrations; and fourthly, we are inviting consultants to spend a day with us at RPG, so you can see our research and manufacturing facilities first hand and learn what we can offer you in surface optimization, design assistance, new product development and acoustical research.

DISTRIBUTION

Because our wide range of products span many markets, we re-organized our distribution channels to better serve our customers and specifiers. Pro Audio and Home Theater products, are sold through authorized dealers and Architectural Acoustics products are sold through authorized distributors. Consultants will be kept up to date through visits of RPG personnel and manufacturer's reps. Let us know how our reps are supporting you.

SERVICE

With the advent of e-mail, our design engineers routinely accept AutoCAD drawings and make prompt product, application and installation recommendations with a much quicker turn around time. Consultants can guide architects to our web page for colorful photos of existing projects to showcase the use of our products. Closest to my heart is our new surface optimization capability, which allows us to custom tailor scattering surfaces to meet the acoustical coverage needs of the consultant and the aesthetic desires of the architect. We will discuss this new capability in the R&D section, but I honestly feel this is the future of architectural acoustics.

AESTHETICS

We understand the struggle between acoustical performance and aesthetics. Until now, form follows function has been our design goal. Our new surface optimization capability allows us to optimize any type of surface, thus opening RPG products to a wider audience. To put the icing on the cake, we have recently installed a state-of-the-art finishing facility.

DISC PROJECT

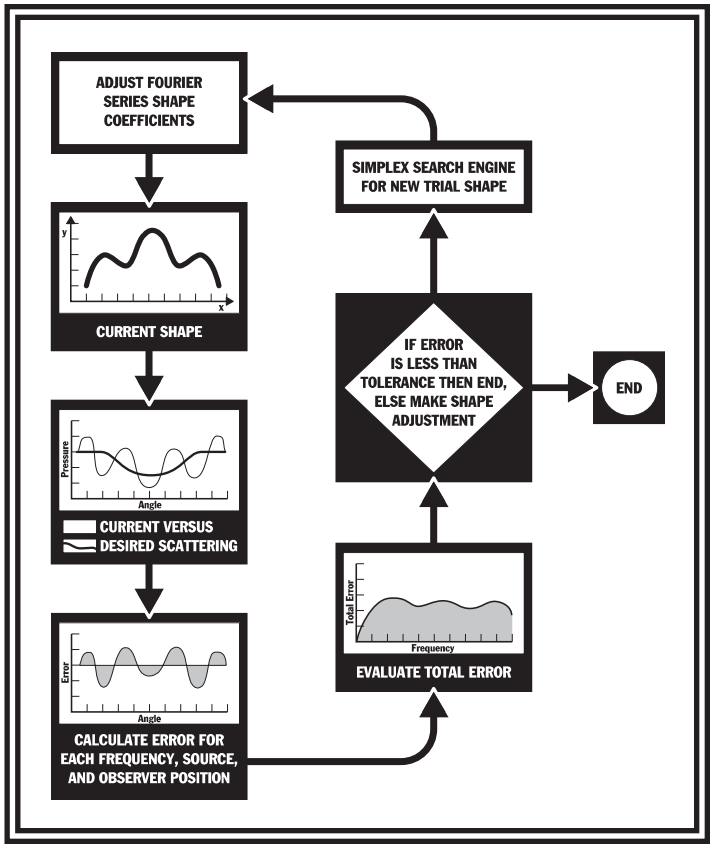
RPG is proud to announce the addition of Dr. Trevor Cox to its research team. Trevor is also a lecturer at Salford University and is the principal investigator in a three year research grant funded by the British Engineering and Physical Sciences Research Council. RPG has co-funded the research as an industrial partner and I will also be acting as a collaborating investigator. The goal of the research is the development of a room acoustic diffusion coefficient. Stay tuned.

RPG®

Research & Development

INTELLIGENT SHAPE OPTIMIZATION

The design of diffusing surfaces started as an art form, with statuary and various forms of surface ornamentation, and evolved into a science, with Manfred Schroeder's seminal papers on the use of mathematical number theory sequences. In the past 13 years, since we commercialized the QRD® diffusor, we have been fortunate to be a part of thousands of facilities containing tens of thousands of our diffusor systems. However, RPG has never been content to rest on its past accomplishments. In fact, our company vision is to maintain our leadership position by providing continuous acoustical innovation. Thus, to further expand the acoustical palette and address issues such as aesthetics, surface shape optimization, coverage, diffusion and absorption, RPG has developed a new design tool called **Intelligent Shape Optimization™.**



ANY SHAPE, ANY SIZE, ANY PERFORMANCE, ANY USE, ANY MATERIAL AND ANY FINISH

RPG is now collaborating with Dr. Trevor Cox, who introduced the concept of optimizing scattering surfaces using boundary element methods in 1995, to make this new innovative technology a reality. To do so we have developed an in-house predictive software technology, which allows us to optimize any surface for a specific use. Therefore, in addition to our "real" products, which we inventory, we will also offer "virtual" shapes, which will be designed and manufactured in a just-in-time process. It is now possible to automatically derive an appropriate curved, stepped, or fractal 1D or 2D surface shape, subject to various architectural constraints, which produces a desired diffusivity or coverage. Since these are "virtual" products, their design involves collaboration between the consultant and RPG. To facilitate this collaboration, we have developed an Arcousthetics™ team at RPG, to create optimized surfaces on demand, that satisfy all of the architectural, acoustic, and aesthetic needs of the project. This "A-team" of acousticians, CAD engineers, manufacturing and finishing specialists will be at the disposal of the acoustical consultant to collaborate in the creation of the best surface for the job. This integrated design and manufacturing capability is now available after many years of software and manufacturing development. We can offer these optimized shapes in Fiber Reinforced Gypsum, Class A Polyester plastic or wood, finished as desired.

ACOUSTICAL SHELLS, OVERHEAD CANOPIES, WALLS, CEILINGS, OVERHEAD REFLECTORS, ETC

Thus a stage canopy can be engineered which provides a desired coverage on stage to specified observation locations, from specified sources. Now much of the guess work of canopy and acoustical shell design can be minimized with accurate coverage plots, using full Boundary Element techniques. Rear and side walls of a venue can be optimized as well as overhead reflectors. Significant improvements in performance are now possible over traditional periodic arcs and other geometrical shapes. This is all possible because we have developed a diffusion coefficient metric to evaluate the diffusivity of a surface. Using an optimization algorithm, we can automatically adjust the Fourier coefficients defining a surface shape until a match between the desired coverage and predicted coverage is reached. A simplified flow diagram of the optimization process is shown in the Figure. The optimization process uses wave acoustics instead of geometrical acoustics. As computational power increases this approach will become even more powerful allowing larger surfaces and wider frequency ranges to be considered. To be continued . . .

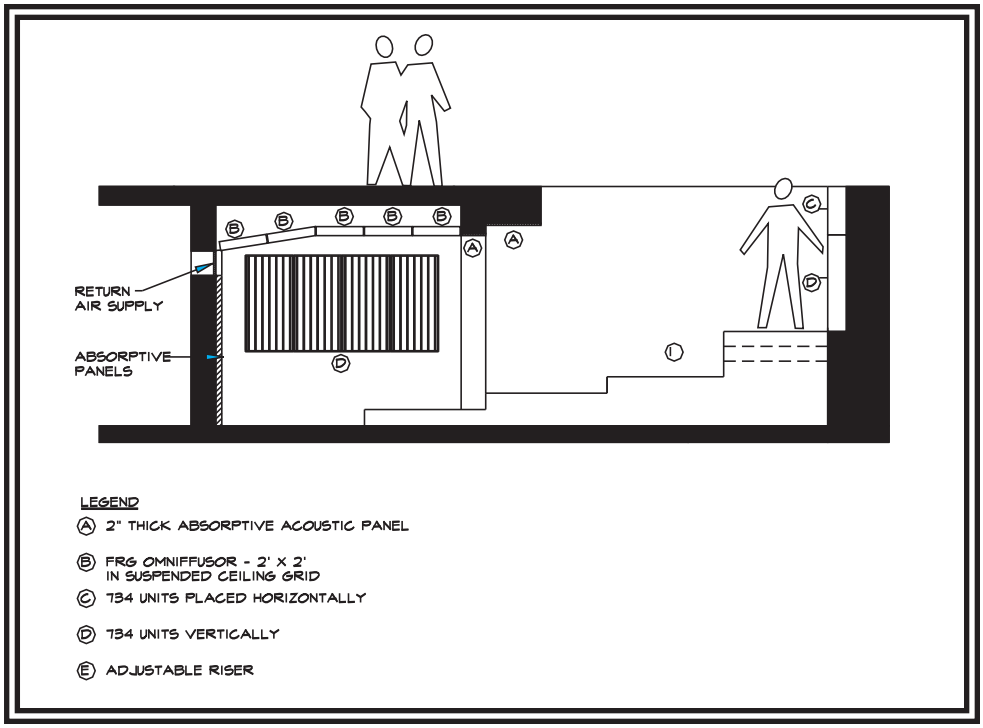
ORCHESTRA PIT

The Orchestra Pit in a Performing Arts Center can often pose one of the largest acoustical challenges to the acoustical consultant. We have been fortunate to work with several consulting firms on resolving some of the typical problems normally encountered in these spaces and can offer the following suggestions based on this work.

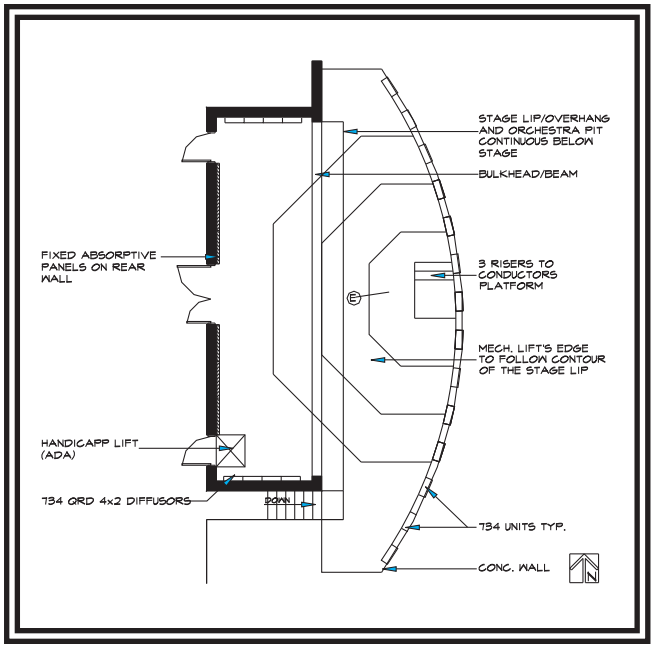
Typically musicians situated in an orchestra pit must overcome harsh acoustic conditions produced by hard reflective surfaces in close proximity to the performer. In order to alleviate these conditions we typically recommend treating the downstage wall of the pit and side walls with our QRD® 734. The ceiling area or overhang could be treated with our FRG Omniffusor®, which provides two dimensional distribution of the reflected energy. Additional treatment in the form of absorptive panels can be used on the upstage wall of the pit to help tame the typically high intensity instruments such as percussion and brass.

The consultant must also be concerned with the amount of energy which reaches the stage and audience. With diffusors located on the downstage wall and ceiling, they help distribute energy more evenly within the pit and out to the stage and audience chamber.

The following series of drawings illustrate the recommend treatment as described above. The Project Profile on the back page of this newsletter describes a facility which made use of this application with excellent results. As always, if you have questions, comments or would like to see us cover a specific design application in a future issue, please drop us a line.

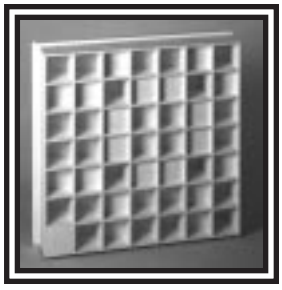


Section through Orchestra Pit



Plan view of Orchestra Pit

QRD® 734



FRG Omniffusor®

Project Profile: Nicholas Music Center

Beyreuth Orchestra Pit

View from house looking toward stage

View from rear of pit looking at downstage wall

ARCHITECT

Designer Ashok Bhavnani, of Bhavnani & King Architects, New York City, employed wall-mounted QRD®'s and ceiling Omniffusors™ in the Beyreuth Pit Design. On stage, wood QRD®s are incorporated in the design of the orchestra shell and custom designed clear acrylic diffusors are suspended above the stage. Mr. Bhavnani felt that, "The patterns and finishes of the various diffusor units fulfill acoustic needs and provide visual scale and texture as well."

CONSULTANT

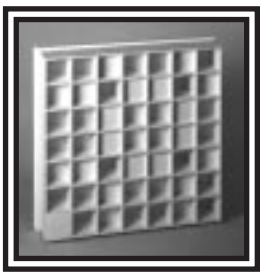
Challenged by the limitations of a Bayreuth style orchestra pit and the retrofit of an existing hall, consultant Todd Berling of Artspace Consulting utilized RPG®'s standard QRD® 734, Omniffusor™ and custom plexiglass ceiling clouds to provide proper sound distribution throughout the hall and orchestra pit, as well as support intercommunication between musicians. Berling indicated that, "RPG® Diffusor Systems were essential to the successful completion of the project."

CLIENT

Rutgers University's Mason Gross School of the Arts sought to create an orchestra pit and improve the acoustics of the 800-seat Nicholas Music Center, the University's principal Opera and concert hall. Dean Marilyn F. Somville said, "RPG® Diffusors are an integral part of both components of the completed project and significantly enhance musical performances."

PRODUCTS

QRD® 734



Omniffusor™