

### Pannello™

RPG is proud to announce the new painted Pannello Bacio, painted panels with absorptive or diffractive cores.

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For up to the minute information, we invite you to visit RPG's acclaimed web site: <http://www.rpginc.com>.

### DIFFUSE NEWS



Dr. Peter D'Antonio  
President and CEO

#### Everything Acoustic!

The question is "What is the Question?" Since RPG was founded, RPG has essentially asked the questions and answered them. We traditionally have studied the market and provided technology and products that we felt were needed. After 20 plus years, RPG has developed a broad range of optimization software, testing facilities and extensive CNC manufacturing capability. We are now asking the acoustical consulting community to tell us what problems you would like us to address and what products you would like us to manufacture. In addition, we are extending an invitation to all senior consultants to spend a day with me, discussing topics of mutual interest, touring our research and manufacturing facilities and getting to know each other. We have already met with many of you and it has been great fun. *This is only the beginning....*

### CONTINUALLY EVOLVING.....

#### PANNELLO™- THE PANEL SYSTEM

Fabric wrapped panels are a highly specified acoustical surface treatment. They are affordable and convenient to use. RPG is proud to announce a new extensive line of absorptive and diffractive panels, called Pannello™ with either textile or acoustically transparent painted non-woven glass matte coverings. The Pannello Bello, shown in Figure 1, is a traditional fabric wrapped panel, however, it is available with an absorptive or a diffractive core, when reflection control is needed and high frequency ambiance is desired. The Pannello Bacio, shown in Figure 2, is a new painted panel,



Figure 1. Pannello Bello fabric wrapped panels, with absorptive or diffractive cores, available in many fabrics, thicknesses and sizes.

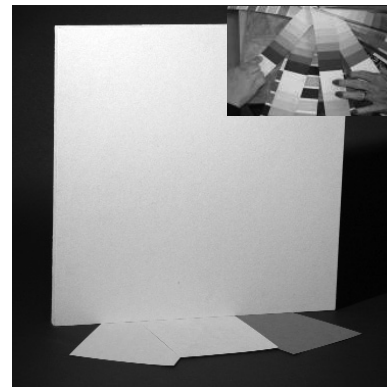


Figure 2. Pannello painted panels with absorptive or diffractive cores, available in many colors, thicknesses and sizes.

utilizing a non-woven glass matte. The acoustically transparent matte can be painted in many colors and offers an alternative to traditional fabrics. Figure 3 illustrates that the absorption of a painted Bacio panel is very similar to that of the raw fiberglass backing.

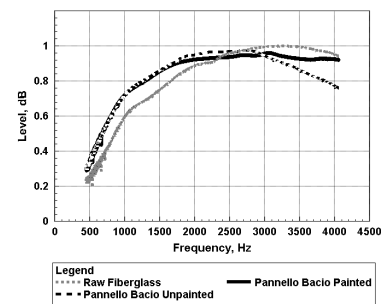


Figure 3. Absorption is not compromised by the painted non-woven matte.

### FLUTTERFREE®-T

For several years, RPG has offered a 1" thick, 4" wide, hardwood molded QRD diffusor, called FlutterFree®, which has enjoyed popularity as a thin flutter control



treatment. Since the QRD technology is now over 20 years old, we wanted to re-examine the design of FlutterFree® and apply the newly patented technology, based on aperiodic modulation of a single asymmetric base shape (simply referred to as AM). The challenge was to extend the low frequency diffusion limit, without increasing the depth of the plank. We were extremely successful and the resulting new product is shown in the bottom of Figure 1 and is called FlutterFree®-T.

This was accomplished by first using a folded well ("L") technique to provide a deeper well than would be possible using a straight well. Two half-width, folded wells were positioned at the two sides of the plank to allow easy fabrication on a wood router with one pass. We then used the Shape Optimizer to obtain an asymmetric, opti-

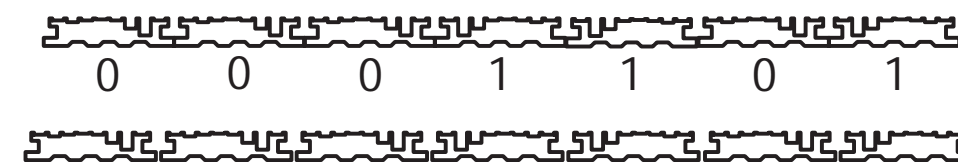


Figure 2. (Top) Aperiodic modulation of base shape (0) and flipped shape (1), using an optimal binary sequence, illustrating the "T" well at intersections. (Bottom) Helmholtz mount with spaced planks.

mized topology profile, which does not rely on prime numbers and the restrictive quantized well depths of number theory.

Because the folded "L" shaped half wells are identical, adjacent units can be either placed in a similar orientation to the previous unit or rotated 180 degrees. Thus we can assign a binary zero to the base shape and a binary

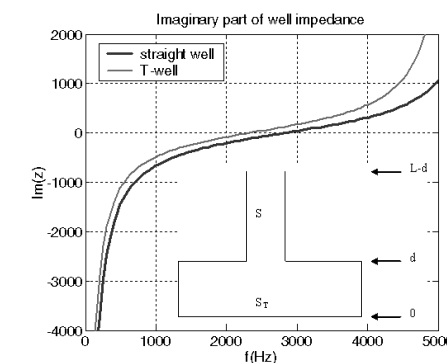


Figure 3. T well construct, with imaginary part of the impedance. (Top) T-well, (Bottom) Straight well.

$$z_d = -jpc \cot(kd) \quad (1)$$

$$z_{L-d} = \frac{-j \frac{S}{S_T} z_d pc \cot(kL) + (\rho c)^2}{\frac{S}{S_T} z_d - jpc \cot(kL)} \quad (2)$$

one to the flipped orientation, allowing aperiodic modulation, as seen in Figure 2. When adjacent planks meet a

"T" well is formed, which is longer than the deepest straight well possible in the unit (0.75") and has very desirable resonance characteristics. Figure 3 shows the imaginary part of the impedance of a T-shaped well at the well mouth in comparison to that of a straight well, without the side cuts forming the T. Systems resonate when the imaginary part of the impedance is zero. It can be seen in Figure 3, that the resonance has shifted to a lower frequency for the T-shaped well (top line), indicating the ability of this well to perturb the sound field at a lower frequency and hence cause diffusion at a lower frequency. Equations 1 and 2, describe the imaginary impedance at d and L-d, where it is assumed that all horizontal dimensions are less than half a wavelength. S is the cross-sectional area of the well mouth, and S<sub>T</sub> the cross-sectional area of the bottom of the T, ρ is the den-

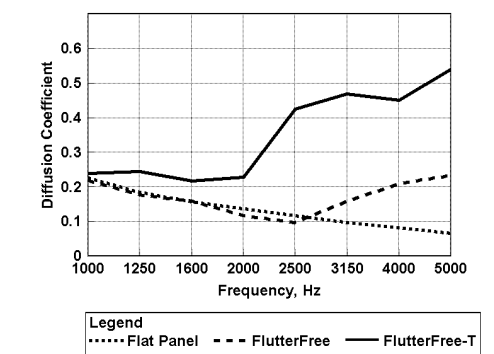


Figure 4. Diffusion coefficient comparison for the new FlutterFree-T (solid), the original FlutterFree (dashed) and a flat panel (dotted).

sity of air; c the speed of sound in air and k is the wavenumber. In Figure 4, it can be seen that the diffusion coefficient is far better than the original FlutterFree® and the lower frequency limit extends down to 1000 Hz, as opposed to 2500 Hz for the original FlutterFree®. The new Flutter Free®-T offers higher diffusion, with a 1000 Hz low frequency cutoff. All at lower cost!