



# Powder Application Case Study – MDF Industry

**RadEX (Canada)**



## RadEX of Canada – from Pioneers to Ph.D.s in Powder Coating MDF

*When it comes to mastering the art of powder coating MDF (medium density fiberboard), persistence has certainly paid off for RadEX, a Canadian custom powder coater. The company began investing in MDF in 1999, and 15 years later is still going strong – though the road hasn't always been easy.*



RadEX started as an off shoot of H&G Powder, an established custom coater since 1986 specializing in powder coating metal parts. But when it came to powder coating MDF, there were no manuals, videos, books or instructions to draw from. As the first MDF UV powder coater in Canada and only the second in North America, RadEX has effectively “written the book” on best practices. With a customer list that includes Marshalls, Calvin Klein, TJ Maxx, Costco and General Electric, there is no doubt that powder coating of MDF is a viable alternative to both thermofoil (laminates) and liquid coating. RadEX attributes their success to early partnerships with powder coating systems supplier Nordson Corporation of Amherst, Ohio; UV and hybrid oven supplier Nutro Corporation of Strongsville, Ohio; UV powder material

supplier Protech Chemical; and various MDF suppliers, such as Flakeboard and Plum Creek.

Rick Grim, plant manager, has been with Radex since its inception and was instrumental in getting the MDF line up and running. After thorough research on the process, Grim and his team turned to



Nordson, a company that also invested heavily in this new process. Nordson equipped an MDF powder coating test lab with an Excel® 2000 booth system and a hybrid preheat and cure oven that included electric infrared (IR), gas convection, and the company's own UV curing lamp technology. At the time, lab manager Steve Brattoli was quickly becoming the go-to guy in the industry for understanding and overcoming the many process variables of powder coating MDF. Unlike powder coating highly conductive metal parts, MDF is a very different substrate with far more variables when it comes to prepping, preheating and curing powder coatings.

“We learned that it is critical to consider moisture content, density profile, board temperature and board smoothness in the MDF coating process,” explains Grim. “If controlled

correctly, these variables can produce a beautiful powder coated finish that is durable, scratch resistant and well-bonded, so it will not delaminate like thermofolios.”

According to Grim and his CAD manager and CNC programmer, Bob Jones, eliminating process variables begins with using MDF that is “powder coating friendly”. This means that the moisture content when entering the preheat oven should be between 7 percent and 9 percent. Ideal moisture content and preheating achieve two things. Preheating drives the core board moisture to the surface making the substrate conductive. Preheating ensures that the core moisture of the board does not outgas during the final cure stage of the process. Density profile has to do with the density of the fibers within the board. Since MDF is effectively an engineered wood, the board density can be controlled by the board manufacturer. Uniformity of the board density allows for more even preheat, coating and finished appearance of the coating after cure. Smoothness of the board is one



variable that is sometimes underestimated and often determines the success or failure of the MDF coater. Dull routing tools can cause imperfections in the board creating small craters in the board’s edges. Board fibers on the board’s surface tend to stand up when the board is within the electrostatic field of the powder coating guns. Both of these variables can be eliminated – not by simply using sharp routing tools, but by diligently sanding the surface and especially the edges of the board.

Once the MDF is sanded properly, it is ready for preheat. Preheat begins in a hybrid electric IR and gas convection oven. Again, the preheat stage forces the board’s core moisture to the surface of the board and makes it conductive and ready for powder coating. Total preheat time is about 90 seconds on average. Specific preheat time is dependent on the thickness and overall size of the board. It is critical to understand the board temperature not only as it exits the preheat oven but more importantly when the board is in front of the powder guns. Inadequate board temperature will result in poor coverage of the board and possibly pin-holing from out-gassing of the board’s core moisture. Over heating can result in what is known as “dry board” causing poor attraction of the powder to the board.

RadEX’s powder coating system, purchased in 2001, consists of a Nordson ColorMax® quick color change system with twin cyclones, 12 Versa Spray® II automatic guns, one Sure Coat® manual gun, and two Econo-Coat® manual guns.



With more than 200 colors in their palette, RadEX chose the Nordson ColorMax system because it could provide them the fastest possible color change with the least amount of downtime. The Nordson system also provides excellent powder reclaim capability with virtually zero waste, as well as the high first pass transfer efficiency of Nordson's powder guns.

"Nordson's willingness to invest in an MDF coating lab and support us with early testing of different powders and boards helped to solidify a partnership that allowed both of us to learn, understand and eventually commercialize the powder coating of MDF," says Grim.

RadEX currently employs fifteen people and boasts a 30,000-square-foot facility. The company runs a single shift, five days per week for the powder coating of MDF, and two shifts for the machining. Starting as a coater only, RadEX expanded by adding CNC machining operations in 2003. Three CNC routers and one sanding machine support the manufacturing operations. The powder coating operation consists of 350 feet of conveyor operating at 10-12 feet per minute. The combination IR/gas convection preheat oven is about twenty feet long. Similarly, the combination IR/gas convection/UV curing oven, both supplied by Nutro, is also roughly 20 feet long. Cure time is about 90 seconds as is preheat time. Total cycle time for a piece of powder coated MDF board is approximately 30 minutes from load to unload.

According to Grim, RadEX chose UV over thermoset because they found that thermoset comprises panel integrity. "Thermoset time and temperature tends to warp the board and crack the edges of the board," Grim explains.

As mentioned previously, the UV process allows a total time within the preheat oven of about 90 seconds and the same in the cure oven. Also, combination IR/convection in the preheat oven and IR/convection/UV in the cure oven bring the board core and the board surface up to temperature quickly. In conventional gas fired thermoset ovens, total cure time alone is anywhere between 10 to 15 minutes. Add to this additional time in the preheat oven, and this tends to overheat the board causing issues with its structural integrity. With IR/convection and UV, RadEX can easily coat board that is between 3/8" and 2" thick. They can also coat assemblies up to 4" thick, although 3/4" to 1-1/8" board is more commonly what they coat on a daily basis. End user products include point of purchase displays, store fixtures, wall systems, change room doors/dividers, medical work station tops, and office furniture desk tops.

So, in combination with all of the process expertise RadEX has gained, and all of the manufacturing and powder coating capabilities they have added over the years, the company has become North America's one-stop-shop for machining and powder coating of MDF. There are few companies that can offer routing, sanding and powder coating all within the same facility. As mentioned previously, it took a lot of learning about the UV powder coating process and all of the variables inherent within the MDF substrate to get where they are today. They've definitely become the foremost experts in their field – going from pioneers to veritable Ph.D.s in MDF powder coating.

**For more information on powder coating technologies from Nordson, call 1.800.433.9319.**

**For more information, speak with your Nordson representative or contact your Nordson regional office.**

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