I would like to start by discussing a number of misconceptions that many people have about this subject. When this topic comes up, many people concentrate on the word “box.” The truth is, the word “box” is just a gimmick to get your attention. The important word is “thinking.” Remember the subtitle: “thinking begets ideas that beget improvements.”

One misconception is that “thinking outside the box” only applies to large high-tech operations. The truth is, there are no limitations. For example, consider the tab on a package of gum. This small tab reduced a lot of frustration—that is, until computers came along. Another misconception is that only certain people are capable of thinking outside the box. It does not take special people to think outside the box; rather, thinking outside the box makes people special. There are no restrictions or limitations on age, sex, education, color, or nationality on who thinks outside the box. The only things these people seem to have in common are: one, they are all thinking people, and two, they are positive in their thinking and actions.

I believe the following examples will prove these statements.

1. A truck was driven into an opening under a viaduct. It was too high for the opening and became wedged so tight that the driver was not able to back the truck out. A small boy came along and asked, “When are you going to get the truck out?” The frustrated driver said, “As soon as I figure out how to do it.” The boy said he did not think it was a big problem, and the man replied, “If you are so smart, how would you do it?” The boy replied, “I would let the air out of the tires until it was low enough to drive out.”

2. It was reported some years ago that the basic principle of sonar was the idea of prominent movie star Hedy Lamarr. She gave her ideas to the U.S. Navy and from those ideas, sonar, as it is now known, was developed.

3. A manufacturer of golf carts developed a new model. Soon after its introduction, the company began receiving reports that the model tipped over if placed on a sharp slope. Alterations suggested by engineers at R&D were found to be excessively expensive. When the West Coast representative demanded that someone from the manufacturer
visit his area so he could prove the company was working on the problem, a new employee from R&D was sent out. The new R&D employee took one look at the problematic cart and asked to get it on a trailer so he could transport it. He took the cart to a nearby farm machinery dealership and asked a service worker if he could put water into the large rear tires. The service worker answered “yes,” and the R&D employee asked him to fill the tires half full. After that, it was almost impossible to tip over the cart. Water was the solution.

4. The final idea needed to make a workable computer came to an assistant professor at Iowa State University while having a drink at a roadhouse in Illinois.

These are examples of thinking outside the box from a boy, probably in middle school; a movie star; an R&D employee with a degree in engineering who fixed the golf cart so easily; and a professor with a PhD. These examples pretty well prove that age, education, gender, and location have little to do with who thinks outside the box.

It is my understanding that some people did not believe that this was a suitable subject for an industrial hygienist. I can’t think of any profession in which people have more opportunities to think outside the box. While carrying out their responsibility of protecting both the physical and mental health of workers, these people are exposed to a great variety of operations, many of which can be improved upon. Some industrial hygienists may claim that it is not their responsibility to improve any and all conditions they observe. I believe that they do have a moral responsibility, if not also a legal responsibility, to improve conditions for workers wherever possible.

I hope you will pardon me for using a number of “thinking outside the box” examples in which I was involved. I use them for two reasons: one, because I know all the details and therefore can provide more information, and two, because I was part of industrial hygiene departments for many years, and many of the examples I will discuss will show that industrial hygienists can and should think outside the box.

The following example should be of interest to all industrial hygienists. At a grinding station, in a crankshaft grinding area in which a water and soluble oil solution was used for cooling, I was asked if I could help an engineer design a ventilation system to remove the smoke and haze that filled the room. The answer was that I could, but I wouldn’t. When asked why I wouldn’t, I answered by asking, “When you first replace the cooling solution, is there any smoke or haze?” After some thinking, the answer was “no.” I then asked if there was any objectionable odor when the cooling solution was first replaced. Again, the answer was “no.” I then explained that I believed the haze and odor problem to be the result of tramp hydraulic oil leaking from the production machines into the coolant. I further stated that I believed they should determine at what amount of tramp oil the problems became apparent.

Following this suggestion, the engineer made daily determinations of the percentage of tramp oil in the solution. It was found when the tramp oil reached 6 percent, both the odors and haze began to be noticeable. A centrifugal separator was installed, and the tramp oil was reduced to and kept below 4 percent. It was then found that they could run the same cutting oil almost indefinitely, without complaints or replacement. There was, of course, more interest in this compound than before with the result. They began a program to determine if the amount of soluble oil could be reduced without affecting operations. Much to everyone’s surprise, the percentages of expensive cutting oil added to the water could be reduced as much as 50
percent without any ill effects on the grinding. By determining and eliminating the cause of the problem instead of trying to control it, the overall operating cost was reduced.

Thinking outside the box often requires a change in thinking or a completely different approach. The control of the relative humidity (RH) in a paint booth is a good example. Lacquer paint can be formulated so it can be successfully applied at almost any RH, provided that the RH remains constant. When there are large variations in RH over short periods of time, obtaining an acceptable paint job becomes difficult, if not impossible.

I kept hearing complaints from paint departments while visiting different plants. I became interested and wondered if there was a reasonable solution to the problem. I first studied official local weather reports for the times during which the most complaints were reported. I had already determined that more complaints occurred during the summer. A typical bad day was when the early morning temperature was around 70°F and the RH approached 100 percent. When the air temperature increased into the nineties in the afternoon, the RH would be reduced to the low forties. A study of a psychometric chart showed the RH of incoming morning air could be decreased to around 80 percent by adding a small amount of heat. This could be done without overheating the painter.

Further study revealed that by varying the volumes of air passing through an evaporative cooler controlled by a relative humidity sensor in the booth, the RH in the afternoon could be increased to 80 percent while reducing the air temperature to which the painter was exposed. After such a system had been in operation for some time, the superintendent of the paint department was asked his opinion of the system. He stated his only criticism was that it was more accurate than it needed to be. This was not a health problem, but a serious manufacturing problem. The company benefited because I thought outside the box.

My next example involves three plants: a warehouse in Memphis, Tenn.; a forge plant in Lansing, Mich.; and a paint preparation area in New Zealand. Excessive heat in the working area was the complaint at all three plants. Thinking outside the box, I recommended that air be brought in from outside and distributed at the 10-foot level in the warehouse and paint preparation areas. Due to the excessively high temperatures in the forge plant, the air was to be supplied at each workstation through outlets located 30 inches above the floor. The outlet air velocity at the grills was to be 4,000 feet per minute. In addition, I recommended that an evaporative cooler (EC) be installed as part of the supply system in each plant.

After the systems were installed, I visited the warehouse on a hot day and spoke with every employee and never heard a complaint about the temperature. In speaking with the employees at the forge plant on an 82°F day, I asked why the EC was not on—didn’t they like it? Their answers were, A, “We do not turn the EC on until it warms up outside,” B, “We have an agreement with management that if the ECs are not workable, then we don’t have to work on a hot day,” and C, “Since this air handling system was installed, the production is the same on the hottest day as it is in winter.” Before the installation, as much as half of the production was lost on a hot day.

A year after my trip to New Zealand, I received a handwritten letter from the manager. In the letter, he thanked me for my help with their heat problem in the paint preparation area. He said the installation had been made following my design, and it had produced a better environment than I’d told them it would. He added that the area had gone from what was considered to be the worst place to work in the plant, temperature-wise, to being considered the best place to
work. His final statement was that the satisfaction was largely due to the EC that I’d insisted be installed.

I would like to explain why an EC improved conditions in each of these plants. The dry bulb (DB) temperature of the air leaving an EC is determined by the wet bulb (WB) temperature of the surrounding air. If the EC was 100 percent efficient, it would leave the unit at wet bulb temperature. The efficiency of a double-bank EC should exceed 90 percent. Summer WB and DB studies performed in 75 cities determined that WB temperatures never exceeded 80°F. A safe assumption could be that the WB temperature of outside air would be 78°F when the DB was 90°F. This 90°F air would only be 6°F below skin temperature and would not provide adequate cooling to prevent stress on the worker. If this outside air is first passed through a 90 percent efficient EC, the DB temperature of the air leaving the cooler would be 80°F. If this air (16°F below skin temperature) is distributed in the space occupied by workers at a velocity of 200 or more feet per minute, adequate cooling will be provided.

Let’s consider some other “thinking outside the box” projects.

I heard of a production problem at a plant that manufactured small plastic fittings that had to be painted to perfectly match the auto bodies to which they would be attached. The problem was that if the relative humidity in the air surrounding the part exceeded 45 percent, they were not able to obtain an acceptable paint job. Of course it was none of my business, but I thought I might be able to help them. Since I was unable to go to the plant myself, my assistant visited the plant at my request. When he showed up at a meeting about the problem, one person questioned why he was sticking his nose into a production problem. Another party stated that they were not doing too well in solving the problem and that they should listen to him.

The first thing he did was to show and explain a physchromatic chart. The chart showed that as the temperature went up, the RH went down. Someone then suggested that they consider heating the air going through the paint booth to keep the RH below 45 percent. He admitted it would be too warm for the operator, but the operator could wear a special suit with a flexible hose attached to a one-ton air conditioner. He also admitted that it would be inconvenient, but he believed the operator could work with it.

They finally solved the problem very simply and with very little cost. They reversed the flow through the oven—that is, each part went through the oven before it was painted. When it came out of the oven, the part and the air around it were warm and had a RH below 45 percent. While the parts were painted, there was enough heat in the part to dry the paint.

The following is an example of an unusual project. I had a request from engineers at GM Styling. When I arrived, they showed me a picture of an unusual belt-sanding machine that was on order. The belt on the machine was six inches or more in width and stood on its edge. The drive pulleys were five or more feet apart. The design was such that a person could sand on any part of the belt. It was obvious it was going to be difficult to collect all the sanding dust that would be generated. While there, I learned that a company on the opposite side of the state had one in operation. I told the engineer I would go and look at this installed machine and come back with my recommendations. I visited the other plant and found it to be a very dusty operation, as expected.

Upon returning to Styling, my suggestion was to have the sander shipped to an industrial sheet-metal shop and to have them develop a control system and install it on the machine. I’m pleased to say that they followed my advice. Some time later, an engineer from the sheet-metal
shop visited Styling and reported that they could capture about 90 percent of the dust with five hoods, but it would take seven to collect it all. He was informed that they wanted all dust collected. Some time later, the unit with the seven hoods was delivered. All that had to be done was connect the hooding to an adequate exhaust system and the unit was ready for use. I believe everyone gained in this case by sending the sander out rather than developing the control system on site.

I would like to present two more examples of thinking outside the box. You might question either or both.

The first example concerns intermittent complaints from a group of employees working in a corner of a large building. When I received a call from the director of safety asking for my help, I was told that these complaints had come from employees over a long period of time. During my visit to the building, I noticed a small operation using open-surface tanks close to the workers. I found nothing there to cause complaints. Twenty feet or more from this operation was a vapor degreaser that did not seem to be in operation. Another twenty or more feet away was a small tryout press. That unit did not seem to be in operation either. I'd brought some large impingers and a pump with me and after surveying the entire area, I began taking samples near the workers. I told the safety staff member that I was sure there was nothing there at the time, but it gave me an excuse to stay and see if I could find what happened only once in awhile.

I had been in the area for over an hour when a man walked toward the degreaser. He put the item he was carrying into the liquid much too fast and, after a time, jerked it out and left it on the floor for the liquid to evaporate. Because of the size of the building and distances involved, none of the workers in the area noticed any odor from this operation, and neither did I. A few minutes later, a man approached the tryout press carrying a heavy metal rod. One end of the rod was red hot. The man placed the heated end into the press and when he pushed the start button, the heated metal was pressed into a different form and was then cut from the rod. The hot object rolled down a sheet-metal chute to the floor and continued to roll about halfway to the degreaser. I immediately knew the cause of the complaints.

When the vapor from the part on the floor came in contact with heat, it formed a very obnoxious gas. I explained this to the safety staff member, and he said they would move the degreaser out of the area. My reply was to tell him not to do it. Instead, he should wait a few days—long enough to get a report from me—and then explain to the workers that the degreaser was the cause of their complaint and that it would be moved. He should have it moved while the employees were at work so they could see it moved out. He asked why I made all of these suggestions. My explanation was that if he did not do it this way, every time a worker had a sore throat, he or she would blame it on that “unexplained thing” that had caused problems before. Some of you may think that this does not fall under “thinking outside the box,” but anyone who has ever had any experience with a number of people complaining of an illness as a result of mass hysteria will agree with me. I have been through such incidents, and I do not want any more of them.

The second unusual situation concerns an oven used to burn the paint off of hooks that hold sheet-metal panels as they are painted. After I had retired, I received a call from an engineer I had worked with previously. He told me they had installed such an oven nearly three years before and had been trying to control fumes and smoke at the inlet of the oven ever since without success, and that the workers were threatening to walk off the job if the fumes were not controlled. I agreed to visit the plant to see if I could come up with a solution to the problem.
When I walked out to see this oven, I took a quick glance and then asked for a stepladder. I got on the ladder near the burner section some feet from the oven entrance. The top of the oven was only a few inches from the ceiling, so I had a hard time seeing the top of the oven. One glance was enough to determine the cause of the problem. One oven roof panel had never been installed. This allowed fumes and heat to escape and then flow to the entrance of the oven. This is where thinking outside the box comes in. While it took only a few minutes to find the cause of the problem, the engineer that had called me, a representative from the sheet-metal company the plant used, and I spent almost two hours putting together my report. Why so long? We were trying to figure out how to rework a small amount of sheet-metal work at the inlet to the oven so that the plant workers would think that that was what eliminated the problem. There was no mention of the missing roof panel in the report, yet all of us knew that such a panel would be in place before the sheet-metal workers left the job.

Why would I suggest such a report? The answer is very simple. If I wrote a short report about the roof opening on the oven, somebody might put all the blame on the engineer involved. I knew this man; he was a better than average engineer, and I could not be part of someone blaming him for not finding the problem. After all, the staff from the oven manufacturer did not find the problem and the staff from the company that installed the oven did not find it either, so why should this man be blamed for not finding the issue? I’m sure he learned a valuable lesson, and that is to look at everything and don’t believe anything anyone tells you when solving a problem.

Thinking outside the box can be used in many different conditions. For example, soon after I started with GM, while talking with the chief engineer from a neighboring state, he told me he was considering citing a new GM foundry for installing the wrong dust collectors. I agreed with him that the collectors would not have been my choice, but even so, it would be a mistake to cite the plant. To explain my statement, I told him that testing showed the air discharged from these collectors did meet existing state air pollution standards. I admitted that they just met the standards, whereas other collectors could reduce the release of material far below the standards. I then continued by saying that he would lose his case, but only after an expensive trial, because the standards were met. This would result in animosity between the plant and the state, which was undesirable. I suggested he not issue any order. In return, I would work with the plant to prevent excessive repairs on the present collectors and oversee the installation of more suitable ones when the present ones wore out. He agreed to accept my suggestion.

When the time came to upgrade the ventilation in the foundry, I recommended to management that a meeting be held with the state engineer when the preliminary plans were available. The plant engineer opposed the suggestion, but management agreed to do so. After the meeting, the plant engineer stated that it was the smartest thing he had done in a long time. He found the state engineer was there to work with him, and in fact, he’d suggested some things that the plant engineer had not realized would be acceptable. Some might say it was none of my business, but everyone came out a winner.

I was not involved in this next example, but learned about it while visiting the “behind-the-scenes” part of Disney World that most people never see. During conversation with my Disney guide, I was told about a serious problem they had. They knew there was leakage in the underground hot water piping system. They had no idea how to determine where the leaks were located. Then one of the employees, a U.S. Air Force retiree, remembered that the Air Force made a monthly infrared scan of the state of Florida. Copies of a recent scan were obtained from the Air Force, and every place where there was a hot water leak showed up on the scan. Again, thinking outside the box paid off.
While visiting a plant in Indiana, I was admiring the remodeling of the reception area. The engineer I was with said he had one unsolved problem: the salespeople using the phone booth in the reception area were disfiguring it by doodling while using the booth. The inside of the booth looked terrible. He then asked if I had any ideas. Thinking outside the box, I said that yes, I did. My suggestion was that he line the inside of the booth with carpeting. He did, and his problem was solved.

While talking with the plant engineer at an eastern plant, he told me his worries about the possibility of water leakage from a steam heating system located above the ceiling of new offices being built for the plant manager and his secretary. He said the manager was almost fanatical about the environment in his office, and if a leak occurred, the plant engineer would have difficulties. My suggestion was to eliminate steam and heat the offices using electricity. His reply was that he held a degree in electrical engineering, and had to have an outsider (me) suggest what should have been an obvious solution to the problem. Again, thinking outside the box paid off.

Some of you may not think the following comes under the heading “thinking outside the box,” but I think it does.

When I was in another plant, a question was raised that involved the movement of air. I didn’t have any smoke tubes with me, so at lunchtime I purchased a wand that children use to blow bubbles. After lunch, I went to the problem area and began to blow bubbles. The recently graduated engineer accompanying me stated he would not blow bubbles because he would look silly. I agreed that he probably would, and then explained a possible scenario that might involve him. He might get an assignment to eliminate a problem that concerned air movement. Without any smoke tubes, and by refusing to “blow bubbles,” he would have no way to determine how the air was flowing or what changes would be necessary to solve the problem. Without much experience with the movement of air, he might assume certain things—things that were not part of the problem. Going ahead with his assumptions, he might design a control system that was approved for installation. After the installation, which would cost hundreds, if not thousands of dollars, the original problem might still exist. I then stated that I believed he would soon find out that management will forgive silliness much quicker than stupidity. It is my hope that he believed me and would, if necessary, “blow bubbles” rather than look stupid.

On the east side of Michigan, there are a number of areas where gas and water flow together. Where this happens, explosions often follow. When I was with the Michigan Occupational Health Section, I maintained good working relations with the state fire marshal. One morning he called and asked me to join him in a study of an explosion at a parochial school the afternoon before. When we arrived, we were met by the local priest. The school building was built in the shape of an L. At the inside corner formed by the junction of the base and upright of the L was a cement slab, maybe eight feet square. In the center of this slab was a steel manhole cover. The pump and motor were below the cover in a pit.

The story we received from the priest was that in the afternoon of the day before, the pump stopped and the water pressure began to decline. The priest decided to look into the well pit. Just as he arrived at the steel cover, one of the sisters called him, and fortunately he walked back to her. He had only gone a few feet when apparently the custodian in the basement installed a new fuse. When he did, the open motor tried to start, and there was an explosion that lifted the iron cover as high as the roof of the school and scorched the side of the building. Later we learned this was the second time there had been an explosion in this well pit.
After gathering all the information we could, the fire marshal declared that all electrical items in the pit must be explosion-proof. He then asked me what type of exhaust I would recommend. He was surprised when I said none. I would, however, recommend a positive air supply system. He wanted to know why supply instead of exhaust. My explanation was that with an exhaust system, there might be times when the air entering the pit would not mix with the air at or near the bottom of the pit because air with different temperatures does not easily mix. By supplying air with a blower, the air would enter with sufficient velocity to thoroughly mix with the pit air before being exhausted. This arrangement would eliminate any possibility of explosive quantities of gas accumulating. There was no question; a safe operation was only possible with the combination of the fire marshal’s demand that there be nothing to ignite any gas that might be present and the industrial hygienist’s demand that there never be enough gas to provide an explosive mixture.

I would like to add that to my knowledge, there was never another explosion in any space where air was supplied. In addition, it is my opinion that if motor compartments in small pleasure boats had air supply instead of exhaust, there would also be fewer explosions.

In 1970, most GM cars had a small grill located below the rear window and the trunk lid opening. The purpose of this grill was to allow outside air to be brought into the passenger compartment by the ventilation system so that it could be easily exhausted. As automobile bodies became tighter, it became more difficult for the air to exit. In fact, to properly heat the car in cold weather, it was often necessary to open a window a slight amount to allow some air to escape. As the weather became cooler in the fall, new car owners began to complain that the heaters did not keep the car interiors warm.

The director of the research garage asked if I had any ideas about this problem. I told him I knew exactly what was causing the problem. Whenever the car was in motion, a low pressure area was generated behind the car body. This caused the entering air to be removed from the car so fast that it could not warm the interior of the car. The director could see how that might be happening, but he was concerned as to how the negative pressure in the car could be measured. I assured him it should not be difficult. We obtained a barometer from the instrument room and placed it in the car. As soon as the car was put in motion, the barometer showed a reduction in pressure. The faster the car moved, the lower the pressure. We never took the car out on the open road because we were afraid the barometer might be ruined. Information was sent to all dealers to close off the entrance to the grill. The grill was removed at the midterm of the model year. This is a good example of a person becoming involved in a field in which he had little or no knowledge.

My next example was shared with me by an engineer with an oil company. When he was based at Baton Rouge, La., there was an employee in the engineering department who did not have a degree. In spite of this, my friend said that he was probably the sharpest person in the department. He told me the following story to prove his statement. This man was sent up the Mississippi River about 60 miles or so to a gas compressor station. He was told to determine if the present gas compressor should be rebuilt or replaced. When the man returned, he was asked what he recommended, and he said to remove the compressor from the system. When asked why, he said the gas was coming into the station at a higher pressure than the unit could provide, so it was not needed; in fact, it was adding undesirable resistance to the flow of gas. My friend then went on to say that he knew if he had been sent up there with the same instructions, he would have recommended the compressor be rebuilt or replaced. This is further proof that anyone can think outside the box.
One winter I was visiting a plant that had a fabric building held up by air pressure. An engineer in the plant told me how he and several others had spent about three hours out in a bad snowstorm. They were afraid that if enough snow piled on the top of the building, it would rupture the fabric. After he had told me a number of things they had tried to remove the snow without success, I asked why they didn’t reduce the air pressure in the building to the point at which the cloth top would begin to sag, then increase the pressure to see if the snow would fall off as the cloth popped into position. I was surprised at his reaction. He said, “Where were you when we needed you?” They finally did just that, but this was after they had worked outside in the storm and tried everything they could think of for almost three hours. This proves that no one person has a monopoly on thinking outside the box.

I hesitate to explain this next example. Our daughter and her husband purchased a condo a few miles north of West Palm Beach, Fla. They were on the first floor. Cement stairs led to another condo on the second floor, and the space under the stairs had been closed in to provide storage space. As soon as they moved in, they placed lawn chairs and other items in this convenient storage space. It was some time before they went to the space to get any of the things stored there. They were shocked at what they found; everything was covered with moisture and many items were ruined. They asked me if there was anything that could be done to make the space usable. I said I thought there was. In an apparent attempt to ventilate this space, there was a six-inch round opening above the door and a grill mounted at the bottom of the door. After removing all the items stored inside as well as all the visible water, I connected a six-inch duct to the opening above the door, ran it across the space, and then turned it downward so as to direct the airflow to the space under the first step of the outside stairs. In this duct was a small propeller fan. Now this is where thinking outside the box comes in.

I installed a timer to operate this fan. It was set to operate the fan in the daylight hours and to shut off the rest of the time. The addition of the timer to the small fan system is what made it work. When running in the daytime, the fan supplied the warm, less humid air from outside to the space. This air both warmed the space and reduced the RH. If it had operated at night, it would have been supplying cooler air with a high RH, adding moisture to the space. Our daughter lived in the condo for two or three more years and was never bothered with moisture again.

I would be remiss if I did not present some warnings along with the suggestion that you think outside the box. The first warning is to be careful; thinking outside the box can be addictive. It is my belief that as one begins to think outside the box, one’s RAM memory begins to tuck more items away for future use, so be careful.

Also be careful when working with people who do not stick to the basics. I know of a case where the chief engineer of a company spent thousands of dollars trying to develop a hot-water heater where the cold water entered the top of the heater and hot water was removed from the bottom. He never made it work. He failed because he was trying to violate the basic flow of material. When heated, water is lighter and tends to rise; when colder, it is heavier and flows to the lowest level.

Keep away from negative-thinking people. A number of years ago, I received a three-page letter from a PhD in the College of Engineering at Harvard University. In this letter, he took me to task because in one of my publications I stated that “industrial ventilation could be defined as the simultaneous supplying and exhausting of air from a space.” He then listed all of the reference books he had checked, and nowhere did he find that definition; therefore, I was not to use it.
Now let’s look at what he is saying. He is telling me that if it can’t be found in a reference book, it cannot be considered. If that were true, we would not have electric lights, steam engines, automobiles, etc. I replied to his letter by saying that when I received a letter from him telling me how I could put air in a space where it could not get out, or take air from a space where it could not get in, I would consider not using that definition again. I am still waiting for his letter.

Be careful when working with high-tech people. Some time ago, there was an article in an industrial hygiene journal. According to the article, a well known, prestigious high-tech organization was asked to evaluate an under-floor exhaust system to control tailpipe gases in a large automobile garage. The article started by saying they had no idea as to the capabilities of the blower because the tag with the information was missing. They did state it was driven by a five-horsepower electric motor. Later they stated the blower was not handling the required amount of air. In the recommendations to the garage owner, they stated a new blower should be installed that would handle a given volume of air against a certain static pressure. Much to my surprise, when I consulted a blower catalog, I found a blower with a three-horsepower motor that would satisfy their recommendations. It is my opinion that the reason the blower with the five-horsepower motor was not handling the proper amount of air is that it was running backwards. A blower running backwards will handle about 50 percent of its rating.

In closing, I would like to paraphrase Shakespeare: “To think or not to think: that is the question.” You have a choice. You can be one of the already too many who always knows the answer, but doesn’t know the question, or you can belong to the group that thinks outside the box. Remember, it does not take special people to think outside the box, but rather, thinking outside the box makes people special.