ISA PAPER for Session on Bristols in Process Control

This is certainly a unique experience to be invited here today to discuss the role of my family in the history of process control over the past three quarters of a century. I appreciate the opportunity.

Going back to the first of the century, The Bristol Company and The Foxboro Company originated out of a father's desire to establish some type of business with his sons. These two companies split as an older brother, with strong academic connections, and a younger brother, with strong mechanical intuitions, were unable to work together; an early example of the academic/practitioner conflict in process control.

In today's business vocabulary, Bennet and Edgar Bristol would be referred to as entrepreneurs. Breaking off from the company that bore their family's name, they formed their own organization, the Industrial Instrument Company, in 1908 in the quiet rural town of Foxborough, Massachusetts. Here are the buildings they purchased for the incredible sum of $65,000 to start the fledgling enterprise. <Figure 1>

As was common in the early part of the century, Bennet was known as B. B. and Edgar was E.H. The two brothers, with their sizable families (E.H. had five children while B.B. had six) moved to Foxboro in 1910 and the family has been active and interested in the town ever since.

A few words are in order for these remarkable brothers who nurtured a fledgling little gauge manufacturer into the giant company it is today. Alike in many ways, with the same untiring energy and enthusiasm, B.B. and E.H. were entirely different in many other ways. B.B. was tall and athletic. He played golf all year round and in the summer added a little tennis, even at the age of seventy-three. An enthusiastic walker, he always had his bird glasses around his neck and neatly recorded in a notebook the various birds he saw. Gardening was another hobby and he took great pleasure in raising a special variety of sweet corn. He was especially interested in wild flowers and ferns and would travel miles out of his way to observe -- not to pick -- some particular rare specimen.

B.B. started The Foxboro Company tradition of participating in and contributing to town affairs. He served as Selectman and permanent member of the Playground Committee.

Although brother E.H. was a semi-professional bike rider as a youth, his later athletic interests consisted mainly of an occasional fishing trip or an automobile drive. He was always an original thinker and enjoyed developing ideas outside as well as inside the "shop", a prevailing term for the workplace in those days. Problems of the shop went with him even on vacations. In fact, wherever he went he was always "thinking and talking shop." He appreciated people who stuck to their guns. More than one instrument development was worked out by employees, often against E.H.'s seeming objection by the very "stick-to-itiveness" which E.H. had instilled.

In his own way each of the brothers, as suited his temperament, worked for the development of the new company and each was an ideal complement to the other. Very early they vowed that no big decision would be made unless both were in agreement. Together they established principles and attitudes that have become an integral part of The Foxboro Company, as it had become named on January 12, 1914. Incidentally, that logo with the long bar on the F was devised, like Lincoln's Gettysburg Address, on the back of an envelope by our sales manager on a train ride from Providence to Foxboro.

The management period of B.B. and E.H. is marked by major technological advances for both Foxboro and for the industry.

Here is the first successful low pressure automobile gauge. <Figure 2> Selling for $3.50, it was used on the Buick, Locomobile, Stearns, and the Vanderbilt Cup winner.

In 1910 Foxboro introduced the first multiple pen recorder and sold our first long-distance recording psychrometer <Figure 3>.

E.H. came up with an idea which led to a major milestone in the instrument industry — the differential pressure meter. Coefficients had been established for a thin plate orifice, and a mechanism was needed to record the differential between upstream and downstream pressures. E.H. took a standard recording gauge, mounted it in a heavy cast iron case. Upstream pressure was connected to the inside of a diaphragm spring and the downstream pressure to the inside of the iron case. The actual motion of the diaphragm to which a pen was attached, was a measurement of the difference between the two opposing pressures. <Figure 4>

The meter was built in this way until 1914 when Foxboro developed the mercury float type gauge. Incidentally, there was a false start here. The floats of the motor were of polished maple and under operating pressure became impregnated with mercury. This minor error was, fortunately, corrected by switching to steel floats.

Instruments in those days were entirely inadequate as measured by today's standards. For instance, the conventional temperature controller had a narrow throttling band and no calibrated scale. The operator couldn't calibrate it and could only guess at the proper control point setting.

For E.H. this was a challenge and in the winter of 1913 - 1914 he had set off a chain of events that were to culminate in a Foxboro leadership presence in automatic control. To the helical element he had invented earlier, he attached a flapper valve used in conjunction with an air bleed nozzle which operated an air relay. With this mechanism and a calibrated dial, he now had the first direct-set and calibrated-scale controller in the industrial field. <Figure 5>

Came 1915 and Foxboro unveiled another surprise. Our recorders were good. Our controllers were good. Why not put the two together and make a recorder-controller in one case? Logical now, it was unheard of then.

It is interesting that ideas that seem so simple and logical today, led to dramatic changes in the instrument industry in the early part of the century. For instance, chart pens were pivoted from the bottom of the case so the ink was always messing things up by running down the pen arm. So Foxboro pivoted them from the top and despite the industry accusing us of having upside-down recorders, it eventually followed us.

As we meet here on the eve of yet another huge ISA show, it's interesting the first Foxboro exhibit booth was at the Panama Pacific International Exposition, the World's Fair in San. Francisco in 1915. <Figure 6> The white, typically New England, fence must have successfully kept the traffic out, but such luminaries as Edison, Ford, and Firestone stopped by to compliment us.

Of course, during this leadership period, the United States became embroiled in two world wars and here, too, Foxboro made its contribution.

When air power first came into its own over the Western front, the British air service commissioned Foxboro to come up with engine temperature indicators for their fighters. E.H. was

at first doubtful we could fill the contract, but a crash program of recruiting resulted in the manpower needed.

In the same way came the airspeed indicators for our own planes, and there are still some old-timers who can remember E.H.'s calibration technique. He'd rev up his DeTamble (a 'fast sports car for the times) and blast down Route 140 with his assistant in the copilot's bucket seat trying to hold on and at the same time adjust the unit. Not all the indicators we made saw service in planes. More than one batch was sunk by German subs. But enough got through so that there were more Foxboro instruments doing World War I duty than all other makes combined.

The first World War II contract for Foxboro was received on June 30, 1941. The U. S. Navy asked us to manufacture for the British Admiralty some highly complex and delicate torpedo mechanisms. In a few months, we had tooled up and were delivering to the British.

This led to a contract with the Newport Naval Torpedo Station for a recorder to ride in a torpedo and chart both the depth and stability during the run. Another group was turning out delicate spinner release mechanisms. A trainer rig for radar operators was another non-process type product being turned out.

We even got our feet wet in what is now popularly known as human engineering--relationship of man to machine. We had one machine where you sat in a cab which was swung back and forth while you tried to peer through a telescope -at a target. It was guaranteed to make you seasick in five minutes. In England, too, despite constant air raid interruptions, production went on: instruments for aviation petrol production, booster gauges for airplane engine supercharges, oxygen gauges to show the supply in aviators' emergency tanks, and' all the flow meters measuring the petrol pumped from Britain to Normandy through the flexible piping of PLUTO (Pipeline Under The Ocean) were Foxboro.

All these efforts culminated in Foxboro proudly accepting the Navy "E" in 1943. <Figure 7>

Well, the two brothers guided the company until the mid-40's when they died within less than two years of each other. Their accomplishments read like the history of the instrument industry itself. E.H. authored more than forty patents, some of them so basic in character as to establish new principles of instrument design and operation.

E.H. and B.B, each had one son, a convenient arrangement, and in 1944 Ben and Rex Bristol inherited the leadership of Foxboro. The company was well established by this t4 me with manufacturing plants in Canada and England as well as extensive expansion in Foxboro. The direction of Ben and Rex from those postwar years to today has placed Foxboro in the Fortune 500 for ten years, expanded manufacturing to five continents, and nurtured the development of products using the latest technologies.

They maintained an open door policy, encouraging anyone with a good idea to drop in and kick it around. They established a first name atmosphere from the top down--and it continues today. One of their prime concerns was quality. As Ben said once, "We may not be. the biggest instrument company, but we will be the best."

The wartime "Manhattan Project" of the Atomic Energy Commission at Oak Ridge introduce the small size strip chart recorder for panels. Many companies contributed, but not Foxboro, and the result was a standard 3-inch miniature recorder. Fortunately, the Company's principle of "not copying the other fellow" withheld our following the trend until a superior instrument using a readable 4-inch scale strip chart was introduced in 1952. This, of course, became the standard. <Figure 8>

This was an era of making decisions, some obvious and easy, some difficult, and some downright daring.

For instance, there had to be a temptation after World War II to rest on our laurels and get our healthy share of business. But Rex and Ben had the vision to spread our production, sales, and, especially, our service to the entire world marketplace. Despite the vicissitudes of international operations, their judgment was obviously correct.

Then, too, Foxboro was clearly established as a leader in mechanical and pneumatic instrumentation, when this upstart called "electronics" came into the game. This decision involved new technologies, new machinery, new training, and, of course, new people. Needless to say, most of our offering today is in electronics. We even have factories dedicated to electronic production alone.

Perhaps one of the toughest decisions to make over the past few decades was regarding the integration of the digital computer into process control. Those of you here must remember how difficult the first dozen years were. I'm sure that there were many Foxboro employees and stockholders that checked the profit and loss figures in the annual report and wondered what kind of folly we were in. Ben and Rex had the courage and foresight to realize that this huge investment was essential if we were to stay on top in the process control business.

They're both sharing an office in the old headquarters building and you'll find them there almost every working day. One of Ben's favorite duties is daily visiting the employees to hand out 10, 25, and 40-year service pins--an effort that is deeply appreciated by these people. <Figure 9>

There is no doubt but that Rex and Ben have different personalities as did their fathers before them, different hobbies and different life styles. But once again, it should be pointed out that they took no major actions without mutual agreement. Looking at the same facts, they reached the same conclusions. Inheritance may have been a factor. They are double cousins. Their fathers married sisters. There has always been a strong big brother, kid brother relationship.

This brings us down to the present generation. My brother, Bill, and I are both carrying on the legacy of the Foxboro Bristol clan. Rex had three daughters, by the way. Bill's involvement is in manufacturing at our electronics plant in East Bridgewater, whereas my interest has always been in product innovation and the continuation of our past technical leadership. We are a big company that tends to resist these initiatives, and so the approach has to be different now; there are fewer patents in my name and more broad technical papers. But one of these patents is the original patent behind what is now the EXACT controller, and one of the papers originates what is now called the RGA. And the work continues on many more computer oriented fronts, aiming for control systems which are ever smarter and more easy to use.

The Waterbury, Connecticut and Foxboro, Massachusetts Bristols still visit each other at family gatherings. The original agreement to disagree was always limited and no longer exists. Communications have been limited by distance and reduced by time, but the Bristols are still interested in each other and in the instrument industry.

Well, that's our share of the Bristol contributions to the industry. In three-quarters of a century, we progressed from this complex little staple for joining the ends of machine belt drives to the latest in total control-SPECTRUM. <Figure 10>

Thank you.