

# WA Technology

## Lincoln Electric Business Philosophy and Employee Incentive System:

*Similarities of the management ideas of Fred Taylor, Henry Ford, and James (called, J.F.) Lincoln.*

*J.F Lincoln created a unique management system, worthy of detail study. He used some methods that were defined by Fred Taylor and employed by Henry Ford. They were sustained for over 50 years of Lincoln's career and 20 years after by his successor. Management methods have adapted to current times and the Company is very successful today.*

## Fred Taylor, the Father of Scientific Management

Fred Taylor was born in 1856 in Pennsylvania.



After the depression of 1873, he became an apprentice patternmaker, gaining shop-floor experience at a pump manufacturing company in Philadelphia. In 1878, Taylor became a machine shop laborer at Midvale Steel Works where he was promoted to gang-boss, foreman, research director,

and finally chief engineer. He became a student of Stevens Institute of Technology, studying via correspondence and obtaining a degree in mechanical engineering in 1883.

Taylor is regarded as the father of scientific management, and the first employing systematic observation and study. In 1911, he published "The Principles of Scientific Management," in which he described how the application of the scientific method could greatly improve productivity of workers. These methods called for optimizing the way tasks were performed and simplifying the jobs so workers could be trained to perform their specialized motions in the one "best" way.

After years of various experiments to determine optimal work methods, Taylor proposed the following four principles of scientific management:

1. Replace rule-of-thumb work methods with methods based on a scientific study.
2. Scientifically select, train, and develop each worker rather than passively leaving them to train themselves.
3. Cooperate with the workers to ensure that the scientifically developed methods are being followed.
4. Divide work nearly equally between managers and workers, so that the managers apply scientific management

principles to planning the work and the workers actually perform the tasks.

### Example, the "Science of Shoveling"

Taylor conducted time studies and determined that the optimal weight that a worker should lift in a shovel was 21 pounds. Since there is a wide range of densities of materials, the shovel should be sized so that it would hold 21 pounds of the substance being shoveled. The firm provided the workers with optimal shovels. The result was a three to four fold increase in productivity and workers were rewarded with pay increases. Prior to scientific management, workers used their own shovels and rarely had the optimal one for the job.

He defined that there is a right way of forcing the shovel into materials and many wrong ways. The way to shovel refractory material is to press the left forearm hard against the upper part of the right leg just below the thigh, take the end of the shovel in the right hand, and push the shovel into the pile. Instead of using the muscular effort of the arms, which is tiresome, throw body weight on the shovel; that pushes the shovel in the pile with hardly any exertion and without tiring the arms in the least.

### Incentive Management

After optimizing shovel size, and for some studies changing the size to fit the man, he was able to show a worker who had achieved loading pig Iron at a rate of 12 tons per day could achieve 47 tons per day by using the optimum techniques. He sustained the increase by providing an economic incentive by paying per ton of iron unloaded at a rate above the average previously achieved. The worker received a 60% wage premium. They switched from moving 92 pounds per load with previous techniques to using Taylor's methods, of smaller loads more often, creating less strain.

While in many cases, the new ways of working were accepted by the workers, in some cases they were not. The use of stopwatches often was a protested issue and led to a strike at one factory where "Taylorism" was being tested. Complaints that Taylorism was dehumanizing led to a United States Congress investigation. Taylor's ideas and many foolish questions by politicians (like today) can be found by reading the yearlong Congressional record of the 1912 probe concerning his methods causing employees to "work too hard!" Typical of Congress, as a result of this probe it passed a law that wasn't repealed until 1949 stating no civil service employee could use a stopwatch!

Another analysis demonstrated that when workers are herded together in gangs, each man in the gang becomes far less efficient than when his personal ambition is stimulated. Taylor's studies showed when men work in gangs, their individual efficiency

falls almost invariably down to or below the level of the worst man in the gang.

After gang work had been broken up at Bethlehem Steel, an unusually fine set of ore shovelers had been developed through careful selection and individual, scientific training. Each of these men was given a separate car to unload each day, and his wages depended upon his own personal work. The man who unloaded the largest amount of ore was paid the highest wages, and an unusual opportunity came for demonstrating the importance of individualizing each worker. Much of this ore came from the Lake Superior region, and the same ore was delivered both in Pittsburgh and in Bethlehem in exactly similar cars. There was a shortage of ore handlers in Pittsburgh, and hearing of the fine gang of laborers that had been developed at Bethlehem, one of the Pittsburgh steel works sent an agent to hire the Bethlehem men. The men were offered 53% more incentive pay per ton for unloading exactly the same ore in Pittsburgh, with the same shovels, from the same car. After carefully considering this situation, it was decided that it would be unwise to pay more for unloading the Bethlehem cars.

Almost all of the ore handlers went to Pittsburgh, but in about six weeks, most of them were again back in Bethlehem unloading ore at the lower old rate. Taylor had the following talk with one of these men after he had returned and he said; "Well, sir, I'll tell you how it was. When we got there, we were put on to a car with eight other men. We started to shovel the ore out just the same as we do here. After about half an hour, I saw the fellow alongside of me doing pretty near nothing, so I said to him, 'Why don't you go to work? Unless we get the ore out of this car we won't get any money on pay-day.' He turned to me and said, 'Who in the (heck) are you?' 'Well,' I said, 'that's none of your business'; and he stood up to me and said, 'You'll be minding your own business, or I'll throw you off this car!' 'The rest of the men put down their shovels and looked as if they were going to back him up; so I said to all of them, 'I will throw a shovelful whenever this fellow throws one, and not another shovelful.' So I watched him, and only shoveled when he shoveled. When payday came around, we had less money than we got here at Bethlehem. After, I went in to the boss and asked him for a car to myself, the same as we got at Bethlehem, but he told me to mind our own business. And when another payday came around I had less money than I earned here at Bethlehem, so I talked with the others who left, and we decided to come back! It shows that in the application of the most elementary principles it is necessary for the management to do their share of the work in cooperating with the workers. The Pittsburgh managers knew just how the results had been

attained at Bethlehem, but they were unwilling to go to the small trouble and expense required to plan ahead and assign a separate car to each shoveler, and then keep an individual record of each man's work, and pay him what he had earned.

## Henry Ford's \$5-a-Day Revolution

Henry Ford was born in 1863, 19 years before J.F.



Lincoln. He applied Fred Taylor's ideas to his factories and no doubt read Taylor's Principles of Scientific Management published in 1911. In 1914, Henry Ford started an industrial revolution by more than doubling wages to \$5 a day—a

move that helped build the U.S. middle class and the modern economy.

In 1913, to help meet the growing demand for the Model T, Henry Ford turned his attention to improving the manufacturing processes. The business model that Ford developed increased production on a grand scale, performed by well-paid workers. It spread throughout the world and became the manufacturing standard for everything from vacuum sweepers to cars, and more.

### Transforming the Assembly Line/ \$5 day

The moving assembly line was perhaps Ford Motor Company's single greatest contribution to the automotive manufacturing process. He made the Model T from 1908 to 1927 continually making cost reductions and reducing price. After the success of the moving assembly line, Henry Ford had another transformative idea: in January 1914, he startled the world by announcing that Ford Motor Company would pay \$5 a day to its workers. The pay increase would also be accompanied by a shorter workday (from nine to eight hours.) While this rate didn't automatically apply to every worker, it more than doubled the average autoworker's wage. Henry's primary objective was to reduce worker attrition—labor turnover from monotonous assembly line work was high. He also reasoned that since it was now possible to build inexpensive cars in volume, more of them could be sold if employees could afford to buy them. The \$5 day helped better the lot of all American workers and contributed to the emergence of the American middle class. Although Ford was not the first to build a self-propelled vehicle with a gasoline engine, he was, however, one of several automotive pioneers who helped this country become a nation of motorists.

Ford incorporated the Ford Motor Company in 1903, proclaiming, "I will build a car for the great multitude." In October 1908, he did so, offering the Model T for \$950. In the Model T's nineteen years of production, its price dipped as low as \$280. Nearly 15,500,000 were sold in the United States alone.

Perhaps Henry Ford's greatest achievement was not the assembly line, but rather that he understood the power of productivity. Ford understood that paying workers more than the average salary would make them work twice as hard, and pump out twice as many Model T's, each one making him wealthier.

After becoming President of Ford Motors in 1919, his son Edsel, long advocated the introduction of a more modern automobile to replace the Model T. However, he was repeatedly overruled by his father. Lagging sales and dwindling market share for the company, however, finally made introduction of a new model inevitable, the Model A. It is reported that Ford spent 100 million dollars retooling the plant to make Model A's.

During the design phase for the Model A in 1927, Henry Ford assured mechanical quality and reliability, leaving it to his son to develop the body design. Edsel also prevailed upon his father to allow the inclusion of four-wheel mechanical brakes and a sliding-gear transmission. The resulting Model A was a commercial success, selling over four million during four years of production.

As President, Edsel Ford often disagreed with his father on major decisions, and was occasionally humiliated in public by the older man. The relationship between the father and son was always close but also always fraught with unhealthy aspects. However, Edsel managed to introduce many lasting changes.

Of interest for the next section about J. F. Lincoln, Henry Ford allowed his son to take over the Presidency when he, Henry was 56 years old. He argued about not following his "any color as long as it's black" (because black was cheap and dried faster) philosophy. Edsel's fancier designed Model A came in four colors and seven body styles. Although Ford apparently wasn't happy about the diversity of the new product, he accepted it. We'll see J.F. Lincoln held fast to his "few new products" and "reduce cost and price" with existing products until his death in 1965 at 82 years of age. But it did not stop there. Bill Irgang, who followed Lincoln as President, believed in and followed Lincoln's business philosophy until he died in 1986 at the age of 79. Both J.F. Lincoln and Bill Irgang were bright and sharp all the time they were President. Therefore, the business principles followed were strict, consistent, and clearly communicated.

## Review "Incentive Management" by James Lincoln

Most of this section was abstracted from a book entitled "Incentive Management" written by J.F. Lincoln in 1951 when he was 69 years old. He had been the key operating individual of the Lincoln Electric Company since 1914, when he was 31. He continued as the main company guiding light until his death at 82 in 1965. Considering the date of the book, his insight into some of the nation's current problems is remarkable. Several management books written by James Lincoln are available at this web site: <http://www.jflfoundation.com/SearchResults.asp?Cat=24> Following a key precept of J.F. Lincoln's business philosophy, "keeping prices as low as possible," they can be purchased at a very nominal price.



### New Age in Industry

In early civilizations, people were placed in classes whose positions and rewards were known and accepted. Under the feudal system, the lower classes did have a few rights the lord would consider. When the industrial revolution came, the worker was still subservient to the boss. With industrialization, competition forces progress in efficiency and workers developed abilities the boss doesn't have. It was recognized that individual ability is of most importance and does not depend on birth or wealth. The nation has been slow to accept that that man can develop into almost any person that his ambition and opportunity allow. With incentive management, a developed person is a genius compared to an environment where incentive is lacking and they are completely underdeveloped.

One reoccurring comment discusses that lowering costs by developing a person's skill, occurs since many overhead jobs become unnecessary. Foremen, inspectors, and clerks become needless as producing at top speed and accuracy is inherent in an effective system.

#### SIDEBAR

##### *Other Incentive System issues*

*Although not mentioned in this book, the following presents my recollection and information obtained over the years about the success of the Lincoln incentive system. Most of these comments relate to an era through the 1980's. Lincoln Electric has a successful incentive system by following the basic concepts that J.F. Lincoln outlines in his books and by having individual rewards based on their easily measured output. Where possible, each day a worker knows what they produce and can see how far above the standard was achieved. A product may be labeled with their initials and if it is returned defective, the cost of the product is deducted from the*



*annual bonus. If they have an idea on ways to speed up a job, they submit it and initially received half the first year's savings now it is factored into their bonus calculation. Employment is guaranteed so there is no fear of losing one's job from providing ideas to increase production. If a worker is not happy with a particular piece rate, they can ask for it to be reevaluated. A person from that department would perform the job for a day. If they could not meet the standard, it would be lowered. However if they exceeded the standard it would be raised an appropriate amount!*

*In peak demand times, overtime work is expected. If a worker exceeds their piece rate, makes a quality product, their end year bonus is based on annual earnings, included the time and a half extra, pay for the longer workweeks. I recall a newspaper article in the late 1970's indicating a number of hourly workers earning over \$100,000/year!*

*There were some caveats, if I recall correctly, there was no paid vacation, and health insurance cost, if desired, was deducted from salary. Today a number of fringe benefits are paid for by the company but compared to the 100% of salary bonuses paid during that boom era the percentage bonus is significantly lower.*

*Most hourly workers quality product output can be measured directly. For salary employees, there were other measures employed. Each year an employee is evaluated and judged. If there were more than 5 or 6, subordinates they had to be forced ranked. At least one of the group was ranked 40% and another 160%. When the annual bonus was announced based on company profits, if it were on average 100%, i.e. and hourly worker would make 100% of their earned salary for the year as a bonus, the salaried folks in that department would get from 40% to 160%! The top performers were rewarded like star athletes for that year.*

### **What Should Be Done With Increased Profits?**

Another important concept of J.F. Lincoln's business philosophy, states the real and ultimate boss is the consumer who pays all wages, taxes, profits and costs. If the customer is to be pleased, he must be continually given lower prices and a better product. Product cost must continually reduce. Workers accept the customer getting a better deal so they will purchase more from their increased output. Workers can accept management and stockholders obtaining a fair return on their contribution and investment.

He goes on to say the primary goal of industry is to make better product to be sold to more people at a lower price. He indicates a price policy of "*all the traffic will bear*" is historically unsuccessful. He notes the proper way to manage an economic slump is to lower prices and thereby increase demand. Increased productivity is a key way to lower costs. In addition, with the Lincoln incentive management system, salaries will necessarily decrease in slow times with decreased bonus pay due to lower profits and possibly lower work hours since guaranteed employment, promised to

employees with over 3 years service, is for 30 not 40 hours a week. If product demand is low, work hours, not jobs are decreased.

### **Abilities Must Be Developed**

J.F. Lincoln equates developing a person's latent skills to developing that of a football player, relating to his experiences at Ohio State. He notes a person's abilities remain latent forever unless there is sufficient drive and an intense desire to develop them. A person must be continually challenged to do better until they feel they have arrived. He states, a leader is needed to bring the best out of anyone. He defines the traits of a leader not a boss: First: occasionally give a person you wish to develop a task that is over their current abilities. Second: they must feel responsibility to the full team of workers. Third: challenging people gives them a feeling of accomplishment; it is not being a slave driver. Fourth: Do not wait to promote someone until an opening naturally occurs. Fifth: a person on the team is your teammate and must be treated as such; do not act as if you're the boss.

Competition and pride are fundamental to humans. Pride in ones company and the competitive drive are major forces for a company.

### **The Incentive**

Selfishness and ambition are interdependent and must be guided by intelligence to be satisfying. Foolish selfishness such as gluttony, drinking, and laziness are foolish and lead to disappointment and sorrow. Intelligent selfishness causes man to struggle toward perfection while foolish selfishness prompts him to steal. Man is not a machine, they act on their incentives and aspirations. Incentives spur people to develop and cooperate. Each worker must be seen as an individual and as a member of a team. Money alone is not the incentive that drives workers. As with an unpaid amateur athlete, pride and the competitive spirit are of prime importance. They train incessantly and work hard to reach a collective goal of winning. The real incentive is "*recognition of our abilities by our contemporaries and ourselves.*"

First, encourage pride by rewarding based on the skill achieved. Profit sharing alone does not distinguish a worker. Serving the public is considered a noble goal and producing a better product at a lower price achieves that goal. As with athletes, they want the team to win but also desire to be recognized as a star. They must have a reward proportional to ability. Lincoln calls their reward a bonus. It goes much further than profit sharing. Rewards are based on contribution and penalties performance driven. The person is rated by all those who have an accurate knowledge of their work several times a year. They can discuss

these ratings. An equal incentive exists for more production, accuracy, cooperation, help in finding more efficient methods and ways to save waste/time. They are also measured on being a self-starter needing little supervision.

The bonus is paid at the end of the year after a dividend is paid to the stockholders. The dividend is usually somewhat more than a safe investment in high-grade bonds. Seed money for future investment is set aside then the remainder is distributed as a bonus. Historically (assuming at the time the book was written) it had varied from 50% to 150% of wages and salaries. The desire was to have the bonus be more than wages. Installing such a system takes time and trust.

### Leadership is Key

It requires strong, fair leaders to manage this type of system. The following introspective questions are posed for managers:

1. Can they show others they deserve to lead; can they be made team captain: i.e. could have been voted by the team?
2. Can they recognize the skill of the worker and do the workers agree?
3. Can they justify their salary and can workers agree?
4. Are they willing to increase their ability and skill to learn new methods to make progress?
5. Can they put workers under incentive pressure to stimulate improvement?
6. Can they control stockholders to agree that savings mostly belongs to the consumer, workers and management and not ask for more rewards for themselves?
7. Will they advance people from within based only on ability?
8. Will they continue to lead honestly and ably after some success or revert to old methods?
9. Are they sure they want to be members of the team and not the boss?

### Piecework and Methods

#### SIDEBAR

##### Histological View

*Piecework has been used for good and bad in industry. If used dishonestly it can destroy cooperation or create resentment. Charley Chaplin's "Modern Times" is a social commentary film made during the 1930's depression. In one scene the "boss" increases machine speed to such an extent the worker, Chaplin, cannot keep up and is even caught in the gears. Chaplin is quoted as saying about the film, "unemployment is the vital question ... machinery should benefit mankind, not spell tragedy and throw it out of work." He set out to transform his observations and anxieties into comedy. Lucile Ball made an even funnier, similar skit where she and Ethel*

*Mertz worked as packers in a candy factory. The boss increased the speed of the assembly line belt at first slowly and then to such a speed they could not keep up and stuffed candy in their mouth and elsewhere to prevent them from falling off the end of the belt. Although both films are funny, they depict what some companies did and how many workers feel about management methods.*

**My Recent Observation:** *I recently went through a plant which I had witnessed switch from MRP (Materials Requirements Planning) driven production to cellular manufacturing. Output and quality had significantly improved and workers were cross-trained on all tasks and could operate each cell with varying numbers to match production needs. They had switched to a "paced line" where a moving belt replaced the individual, manually moved carts. The general manager told me the speed could be increased as skill improved. I asked if he had seen "Modern Times?" He had not. I suggested he watch it, and be confident the workers understood and agreed with any changes. I also felt the cooperation among workers in a cell might be reduced since if a problem occurred they could not circle around one station without stopping the whole line.*

*I have watched plants where group piecework was practiced. In some cases, the work environment appeared more like the movie, "Lord of the Flies" where the worst of man's inhumanity to his fellow man was observed, not healthy communications. Although not emphasized specifically in J.F. Lincoln's book, my understanding of their piece rate system is it is similar to what Fred Taylor would advocate, individual incentives measured and reported quickly.*

As Taylor advocated, J.F. Lincoln states the operator should not be the person primarily responsible for continuing progress in production methods, that is management's responsibility. Jobs must be time studied. Lincoln notes that time study personnel must be at least as expert at performing the task as the worker. They should probably come up through the ranks and be respected by the workers. They should not be viewed as spies that are looking for ways to cut wages. Time study often leads to 1) a reduction in wasted motion by repositioning parts etc, 2) improved tools, 3) replacement of manual handling with mechanical means, 4) development of new techniques to make a function faster, or 5) redesigning the part to eliminate some assembly functions.

### Guaranteed Employment

Not emphasized in this book, in the 1950's Lincoln instituted guaranteed employment. After 3 years of service, Lincoln guaranteed a 30-hour workweek in slow economic times and expected workers to give at least 48 hours while receiving overtime pay in good economic times. This avoids hiring more people only to have to lay them off in slow times. It also assured contributions of new ideas to improve productivity without the fear of losing one's job. These programs have served the company very well. In the difficult times in the early 1980's for the welding industry, they also introduced a program

where capable production workers could go into field sales to help increase product demand.

### Focus on Existing Products

Like Henry Ford, who kept the same style Model T Ford from about 1914 until the introduction of the Model A in 1929, Lincoln felt it was more important and profitable to improve existing products than to introduce new ones. He states that success for a manufacturing company depends on progressively improving existing products and making them more economical. If this continual improvement stops, completion will overtake and pass the companies efforts. He also notes a new product will become the center of attraction for management and existing product lines will have less of the needed improvement attention. He mentions that progressive improvement of existing products is easier than with new ones since you know the product better. He states, *“Our salesman will often bring in orders for special products which are departures from our standard line, they seem attractive because the price they bring seems higher. “If we follow any will-of-the-wisp we will get the usual will-of-the-wisp penalty.”*

### Government is Making Softies

Most of this review is paraphrased from J.F. Lincoln’s book with few direct quotes. However, this section is a series of combined direct quotes, which are shown *in italics*.

*“For the first time in American history, free enterprise is being destroyed by high-minded incompetents who have only the best interest of America at heart, but whose knowledge of what makes the economy successfully progress is completely nil.” “Because of this and their soft-hearted “do-gooder” attitude in which they are perhaps entirely honest, they are destroying America” “Our present policy of government-promised security is providing a race of incompetent softie.” “The program of the various deals, “New” and “Fair” has already stopped and reversed the development on which we depend for our future progress and national security.” “We have developed a philosophy which shuns individual responsibility.” “When all citizens depend on government support it takes most of the earnings of most producers to provide a bare living for all.” “One way to remedy a slip (in the economy) is to borrow from the future and live at the old rate on borrowed money.” “The problem with the next generation suffering for our sins leaves us cold. Why worry about them they are not even born yet.”*

*“Desire for freedom was why America was founded.” “Few (politicians) understand what makes free enterprise succeed.” “The loafer should not be allowed to live on the efforts of the worker.”*

*“This is an easy way out but its national suicide, as history shows.” “Every nation that has disappeared has gone through the same sequence and the same result; 1<sup>st</sup> softening of peoples ambition and lessening incentives; 2<sup>nd</sup> increase in numbers of people who fail to develop themselves or their latent abilities; 3<sup>rd</sup> a feeling of helplessness; 4<sup>th</sup> public support for all who ask for it; 5<sup>th</sup> insolvency of the economy as fewer will work to care for the careless and because of the softening process; and 6<sup>th</sup> being taken over by a virile nation that has not gone soft.”*

*“Will the average person exercise their responsibility as a citizen of a representative government so the freedom on which is future depends will continue? Our experience under Roosevelt and Truman answers the question with a definite NO.” “Putting the power of the state over the operations of industry is called socialism by some, communism by others; in actuality, it is called a totalitarian government where the citizen is a serf of government directed by bureaucracy.”*

### SIDEBAR

#### Totalitarianism -My Experience

*My experience with the effects of totalitarian governments reinforces the illogic of a central bureaucracy managing the needs and wants of the individual.*

*In the mid 1970’s we participated in a technical exchange with a famous Russian welding institute. We both had targeted objectives, ours was electroslag welding and fused flux manufacture, and theirs bonded flux manufacture. After several years, we made little progress. We decided to keep the last meeting small. Two representatives from Russia came to the Ohio R&D lab that I managed, a researcher who we had grown to know and the “interpreter” (who participated in every exchange visit and was actually more than an interpreter!) We had been told that in a previous visit to our Ohio Lab they believed we had taken them to the “mayor’s” house for dinner, as they could not believe it was the home of our business manager. I decided to pick them up at the airport and take them to McDonalds for lunch to show how the average American ate! The researcher asked an interesting question at lunch. What was the difference in pay between our engineers and technicians? I thought about the salaries, the overtime pay the technician earned and the increased taxes paid by the engineer because of his salary level and felt it was about 30%. I then asked what the differences were in Russia. He said, “Much more and difficult to measure. For example, because of my position I can get an apartment my technician cannot, he and his family live with his parents. I can get a new car, it may take 6 months to a year but I can get on the list, he cannot. Food is inexpensive for both but for many other products my family gets priority.” I then asked about the cost of a refrigerator to get a feel for a typical product price. He said, “Oh refrigerators are very cheap because the central planners made many more than people need! However, you cannot get a washing machine because they did not plan enough!” That prompted a conversation in Russian between him and the “interpreter” which was obviously contentious!*



*During that same visit, I had to ask my good friend and Cuban born technician to stay home because of his expressed passionate dislike of Russians. His father had a small farm in Cuba and my friend would help pick tobacco from their field and roll a cigar for his dad. He and some of his family were able to leave Cuba when the Castro regime took over but his dad stayed. His farm was taken away from him by the regime but it did not go to the "people" it went to the communist mayor of the town! My friend's emotions were so high, it was better to have him stay home then perform a demonstration for our guests as had been planned! (Some years later, he was able to get his dad out of Cuba during the "Freedom Flotilla.")*

*A reinforcement of the effects of central planning occurred in the mid 1980's when we had a small welding equipment factory in West Germany. A large welding fixture builder purchased our US made submerged arc equipment. I was visiting to discuss a number of tandem welding machines he was selling to Russia. I asked if it bothered him to sell to the Russians since it was obvious he had no love for them! He said, with a laugh, "No, because the central planners in Moscow always buy products the fabricating plant does not need. In addition, by the time they transport the product to a plant many of the parts are stolen!" Quoting J.F. Lincoln, "No bureaucrat can operate any industry successfully."*

## Conclusion

J.F. Lincoln had some unique ideas, some similar to the teachings of Fred Taylor and what Henry Ford accomplished in his early years. J.F. Lincoln unified the concepts and maintained the discipline to retain them though the latter years of his life until he was 82 years old. These concepts were retained by his successor, Bill Irrgang who ran the company after J.F. Lincoln's death in 1965 until 1986. Irrgang believed in and followed J.F. Lincoln's business philosophy and tactics. Therefore, unlike Henry Ford who in 1927 was reportedly upset when his son Edsel convinced him to make a dramatic change in his always improving but "any color as long as it's black" Model T, Lincoln Electric followed a similar business practice through the mid 1980's.

Another chapter of the book entitled "Manufacturing a Few Things Well, 1945 -1965, emphasizes J.F. Lincoln's philosophy of improving existing products by lowering cost and price over introducing new, different products. That strategy was a company strength, however despite Lincoln's low price pressure; it allowed others to exist by offering newer and tailored products to meet unique needs,

## Review: "Lincoln Electric- a history" by Virginia Dawson

There is additional information about the Lincoln Electric business philosophy in a book written by Virginia Dawson entitled "Lincoln Electric, a History." This book, also available on the Lincoln Electric web site mentioned previously, was published in 1999 and brings the management

system through that date, and notes changes in the incentive system when implemented.

## Incentive System

The Company showed a strong profit in the middle of the depression and J.F. Lincoln offered a generous bonus program that became legendary. The advanced reward for performance system was a key part of the Lincoln Electric's success for many years, however with the difficulties encountered with overseas acquisitions in the 1990's the companies' profits declined and the bonus pool severely reduced. This created employee discontent. After hiring a consulting firm, a revised system was developed having several key differences. First, there was a new "formula based system" for defining what had been less than a transparent bonus amount. It took the mystery out of what it would be each year. Second, base pay was revised to be more congruent with comparable wages for given positions. Third, the merit based rating system for hourly workers was felt to be satisfactory and retained. Fourth, a comprehensive benefits package was crafted, including health care, retirement, and improved vacation policy. The changes were effective and the company has performed very well in recent years.

## Limiting New Products

J.F. Lincoln believed the effort to develop different products increased overhead and resulted in lower output per employee. He preferred to stake the company's reputation on product quality and trained sales engineers. As an example of how this affected the business direction, the engineer who developed their most successful stick electrode would often lock horns with J.F. Lincoln over the issue of new product development. Lincoln insisted for every new product introduced one had to be removed! Another example is the purposeful delay in entering the gas shielding MIG business so as not to support anything that could assist the gas producer competitors. Both J.F. Lincoln and the President who followed after his death, Bill Irrgang, believed in the development of a flux cored wire that did not use shielding gas. This product, which they called Innershield, was thought to be the key to achieving the unique creation that would set them apart from those selling products needing shielding gas. This myopic focus on that product development permeated all of the company for over 20 years. A conflict between Lincoln and their business partner in Scotland, Big Three, with BOC in England reinforced Bill Irrgang's belief that they should not build products that support the use of shielding gas.



**SIDEBAR****Focus on Existing Products- Innershield**

Virginia Dawson quotes Lincoln personnel noting that in the 1970's Lincoln's most loyal customers were switching to gas shielded, solid wire MIG welding. Bill Irrgang, followed J.F. Lincoln's beliefs, and resisted developing a line of gas-shielded products fearing having to introduce many new products thereby diluting improvement efforts on existing products and diluting the efforts to develop and promote Innershield gasless cored wire. Dawson writes; "It also strengthened the market positions of competitors Miller, Hobart, and L-TEC (a company I named!) An interesting anecdote about the development of self-shielding cored wire mentions a reported comment by J.F. Lincoln, who remained as the head of the company bearing his name until his death in 1965 at age 82. One of their research engineers reportedly showed him a flux cored wire he developed that used CO<sub>2</sub> gas shielding. J.F. Lincoln (who had fought the major gas companies who promoted oxyacetylene "gas welding" over "electric welding" much of his career) reportedly said, "If I wanted you to use gas shielding I would have asked for that - go back to the drawing board!"

Reinforcing the company's dedication not to support anything that could assist their gas supplier competitors, is Lincoln's first compact MIG welding machine designed for Innershield welding with their gasless Innershield wire. When lifting the wire access door, a label inside stated something to the effect, "This machine is not designed to be used with gas shielded processes. If used for that purpose, it is at your own risk!"

Lincoln Electric also refused to label their first small diameter solid wire as meeting AWS Specifications for MIG welding! William Irrgang, heading the company from the time was 58 years old when he became President, closely followed J.F. Lincoln's business philosophies. The small diameter MIG sold wire they sold was labeled with a Submerged Arc Welding Specification, AWS SFA5.17; EM13K. It is likely little, if any, of the 0.035/0.045 inch diameter wire was every sold for use with the submerged arc process! It is the same alloy as the MIG wire specification AWS SFA5.18; ER70S-3, however Lincoln did not have to endorse the use of shielding gas by reporting the wire qualification test was made with gas!

A former Lincoln R&D engineer indicated when Irrgang was President; he worked on a clandestine project for a sales manager to add a gas solenoid to an Innershield wire feeder. He allowed this manager to enter his lab to see what he had devised. He could have been fired since this was not allowed!

During that time period, while a guest speaker at his local AWS Section monthly meeting, I was told by a Lincoln salesperson who was Chair of the Section, that Bill Irrgang and Ted Willis (then 2nd in command at Lincoln) were at a recent sales meeting in his area and someone mentioned the word MIG when asking a question. The second time MIG was mentioned Mr. Willis reportedly stood up and the room was silent (he was very tall.) He stated, "Mr. Irrgang indicated anyone who feels the urge to say the word MIG again can leave the room now!"

Both J.F. Lincoln and Bill Irrgang controlled what new products could be introduced into the product line since reportedly only the President could add a part number in the system! In fact, the President also priced all products. This control was reinforced at an industry association meeting I attended where

a Lincoln Vice President at lunch stated; "Only two people at Lincoln control prices, the President, and myself." I inquired; "I understood it was only the President?" He said jokingly; "Well someone must bring him the product costs and have the prices he sets implemented - that's my job!"

During my career, mostly employed by one of the Lincoln competitors, when attending business meetings for our various welding and gases businesses that paid for my groups activities, first in R&D and then Market Development, I was occasionally asked what I thought Lincoln might do in a particular situation. I had read and reread J.F. Lincoln's books and would relay what he said and what had always been followed in the past, lower price and not introduce many new products. I recall an incident at the Cleveland airport when managing a welding R&D group located in Ohio. I was rereading one of J.F. Lincoln's books when Ted Willis, then President of Lincoln, came up to me and said, "Young man do you know you're reading a book written by our founder?" He introduced himself. I told him who I was and that I appreciated J.F. Lincoln's business philosophy." He introduced me to a VP that was with him who said; "I know who you are, I follow you to all the pipe mills!" At that time, we sold specially designed submerged arc flux and wire to all of the North American UOE natural gas and oil, large diameter pipemills, many using a 3 wire, 3000-amp system I had developed! It was a very high volume, profitable business for our company!

**Lincoln Electric Promotes Welding**

In 1917, welding was considered a repair tool, not one used for production. When J.F. Lincoln tried to convince the Navy that welding could be used to build ships instead of rivets, an admiral reportedly said; "You can't weld ships, I could knock off with my foot any weld you could make!" In the mid 1920's Charley Davis, who Lincoln hired when Davis graduated from Ohio State, wrote, "Arc Welding the New Age in Iron and Steel" designed to provide information about the generic benefits of welding. Davis also wrote a Lincoln publication called the "Stabilizer, which discussed the virtues of welding and what it could do, particularly for smaller users. By 1948 it had over 100,000 subscribers and by 1999 130,000 (I was one!) Omar Blodgett, a Lincoln employee, (picture left) continued this generic promotion of welding effort and is known worldwide for his many welding design articles and books about how to apply welding economically.

**Review: "A New Approach to industrial Economics" by James Lincoln**

J.F. Lincoln wrote this book in 1961 when he was 79 years old. It reinforces his lower cost and lower pricing ideas, limiting product expansion and incentive management concepts.



## Price Cutting

When prices are negotiated between a supplier and user, the customer has distrust and still looks at the supplier as a potential crook. Did I get the best price? If a producer can cut the price on one case, he should be able to cut the price in every case. The seller has the responsibility to tell the buyer the truth since he is the expert. This is equally true if the proper item has to come from a seller's competitor. In the end, sales persons will change from peddlers to consultants and advertising will be changed to instruction. Both the number of sales persons and quantity of advertising will decrease.

## Methods of Applying Incentives

Workers must feel that greater efficiency will not in any way endanger their employment. Two of the most important incentives for the employee are:

1. Money in proportion to production
2. Status as a reward for achievement

Money in itself is not as great an incentive as self-respect and admiration of contemporaries. The amateur athlete playing a game is a good example. His only reward is recognition for his efforts. The success of any incentive system depends completely on its acceptance by workers. The amount itself will not assure results no matter how good the manager thinks it is. Workers are suspicious of management and incentives have been used to gain more production for less cost. Workers are smart; they readily see the objective is to get them to work harder for less reward.

Certain principles must be followed for a successful incentive program. First: there must be no limit on what they can earn; piece rate must not be changed unless changes in methods are devised. Second: management must be creative and be the guiding light in improving production methods including investing in new equipment. Third: the earnings of each employee must be in accordance with accomplishment. The plan should also reward for accuracy of work, contributions to improving productivity and cooperation.

## Limiting Product Range

No company should go into business producing a product unless they can offer the user a better product at a better price using their inherent skills. If a company is best at engineering and development of new products, that should be their expectation to outdistance the competition. If production is their strongest area then manufacturing methods and cost should be the foundation on which success is based. Industrialists forget Henry Ford gave the customer an excellent standardized car at a continually lower price from nearly \$1000 to less than \$300. Making one product consistently better and cheaper is

relatively easy compared to doing the same thing for many products.

## Conclusion

This last book written by J.F. Lincoln reinforced his strong commitment to managing by rewarding employees for increased productivity and belief that reducing costs on existing products was a better business philosophy that introducing a wide range of new products.

This approach provided consumers with low cost, adequate function welding products and kept out low cost labor, foreign competition. However, it also allowed competitors to focus on new products requiring more R&D and sales efforts (I worked much of my career for such a company!)

Lincoln Electric made many positive changes when Don Hastings became President in 1986 and then CEO in 1992. John Stropki, the North America President from 1996 and President and CEO from 2004 to 2013, also made significant advancements. Lincoln has significantly expanded their product line to include new advanced products including a full line of gas shielded MIG and TIG products. They have successfully developed quality businesses overseas. The incentive bonus paid reflects the success. Soon after the incentive system changes were made, in 1998 the company paid an average bonus of \$6500 to over 3000 workers. The average employee bonus for the 3000 American workers in 2014 was \$33,029.

J.F. Lincoln also states in the conclusions, "patents eliminate competition, and exploit users." This is reinforced in an article in the 1994 winter edition of *The Lincoln Stabilizer* that states, "As a company, Lincoln did not believe in protection by patents or other forms of monopoly that interfered with competition. Certain products were patented only to protect the company from infringement suits."

Patents are an area where I have some disagreement with J.F. Lincoln's ideas. If it were not for four of my six recent patents, others could exploit these inventions that significantly reduce welding costs. That could have possibly prevented them from being widely used because those selling welding gases have little incentive to offer these products to their customers, since they typically cut MIG welding shielding gas use in half! However, I follow J.F. Lincoln's teaching of "keep prices low" and have kept product price low! User payback is often measured in weeks with weld start quality visibly improved. Without patent protection, there would not have been the motivation or incentive to spend the development effort, devise production methods, and invest in the ongoing marketing costs for these MIG shielding gas savings products.

*By Jerry Utrachi, President WA Technology*

## Have a MIG Welder? Know Someone with a Fabrication Shop?

Do Them a Big Favor and Have Them  
Review the Shielding Gas Saving  
Information on Our Web Site:

[www.NetWelding.com](http://www.NetWelding.com)

*If You Have a Home Shop -  
Have You Run Out of Shielding  
Gas on a Saturday or Sunday?  
We Have a Solution:*

### How Much Gas Can Be Saved??

The best way to show the gas savings of our patented Gas Saver System (**GSS**) is with an example from one of our industrial customers who tested the system then bought them for all 35 of his MIG welders.



A Texas Truck  
Box  
manufacturer  
evaluated the  
**GSS** system on a  
repetitive job,  
welding doors.  
With their

standard gas delivery hose they welded **236 doors** with a full cylinder of shielding gas. Just substituting their gas hose with our patented **GSS** maintaining the same flow settings they welded **632 doors!** That's a 63% reduction in shielding gas use.

### Weld Performance Improvement

A small shop owner provided this feedback after he purchased a 3 foot **GSS** for his small MIG welder. Al Hackethal reported these findings:



*"Well, I can't believe it. I never thought a hose could make that much of a difference. I had a small job that's been waiting for a while. The weld quality, and even penetration is considerable better. Almost no spatter! The weld seemed to be hotter and I turned my MIG down a notch.*

*Initially thought that my imagination had kicked in, but then realized that the gas I'm buying is actually working the way it's supposed to. Glad I found your website. This is one of the few things that really works better than any info could suggest. I understood the theory, though in practice I understood much better after the first couple of welds. Now I have better looking welds and almost no spatter, which means less grinding and finish work! In addition, the tip was cleaner after the job I just did.*

*This will provide savings in time, labor and maybe even consumables too. As a one man shop there's never enough time for anything.*

Al also has a TIG welder and bought one of our Leather Cable Covers. His email said this about it!

*Oh, the leather wrap for my TIG hoses worked very well and fits perfectly. I'd just replaced the hoses and was looking for something to protect them that was better than the nylon wrap that's available around here. Now I'm "TIGing" again too, and much safer. It's good to know the coolant hoses are well protected. Much better than using a 300 amp TIG and then realizing that I was standing in a puddle of coolant, which is what recently happened. Can't pay the bills if I electrocute myself!*

*Thanks for making products affordable".*

## Another Home Shop Writes About GSS System

Perry Thomasson has a very well equipped home shop. He uses a 175 amp MIG welder. However the small welder cart only held a medium size shielding gas cylinder and Perry wanted to reduce the number of times he had to have it filled.



He purchased the largest cylinder his distributor offered for sale and chained it to a wall in his shop. He needed a much longer gas delivery hose so he added a 50 foot conventional 1/4 inch ID hose. He found he was using a lot of gas.

He purchased a 50 foot long **GSS** and saved a significant amount of shielding gas while improving his weld starts by reducing the starting gas surge. Since his regulator/flowgauge had a hose barb on the output, we supplied Perry with a splice connection on the supply end of the **GSS**. He simply cut the existing gas delivery hose close to the regulator and spliced in the **GSS** hose. The welder end uses a standard CGA fitting that is supplied with the system.

Perry emailed a picture and said;

*" The system works great. Thanks for the professional service and a great product."*

*About a year after Perry bought his system his brother bought the same products for his MIG welder.*

## A Professional Street Rod Builder Had This to Say About the GSS:

They use a 250 amp MIG welder with built in feeder and a 6 foot gas delivery hose. With their standard gas delivery hose the peak shielding flow at weld start was measured at 150 CFH, far more than needed and enough to pull air into the shielding stream. Air is then sucked into the gas stream causing inferior weld starts and possibly weld porosity.

With the **GSS** replacing their existing hose, the peak flow surge at the weld start was about 50 CFH and it quickly reduced to the 25 CFH setting. With the many short welds made and frequent inching of the wire, they now use less than half the gas and have better starts.



Kyle Bond, President, indicated a big benefit is the reduced time and effort

changing cylinders less than half the time. He quickly saw the improvement achieved in weld start quality as a significant advantage! Kyle, an excellent automotive painter, was well aware of the effects of gas surge caused by pressure buildup in the delivery hose when stopped. He has to deal with the visible effects in the air hose lines on the spray gun in his paint booth! It's too bad we can't see the shielding gas waste as Kyle can the effects of excess pressure when he triggers his spray gun! The paint surge is visible and creates defects unless the gun is triggered off the part being painted! Kyle can manage the surge by triggering the paint gun off the part; unfortunately



we can't start our weld with the MIG gun off the part ! The **GSS** has a built in surge flow limiting orifice that keeps the peak flow from becoming excessive. So you not only save gas you improve your weld starts!

**How Does The GSS Work?**

Gas waste occurs every time you pull the MIG torch trigger even if it's only to inch the wire to cut off the end.



To keep flow at the preset level the gas pressure in the cylinder regulator will be between 25 and 80 psi. Flowgauge regulators (those with a flow calibrated pressure gauge) operate in this pressure range as well.) However to flow



shielding gas through the welder and torch typically requires 3 to 5 psi depending on restrictions.

Therefore every time welding stops the pressure in the gas hose raises to the regulator pressure of 25 to 80 psi. That stores up to 7 times the hose volume of gas in the hose. This is similar to your shielding gas cylinder which holds about 150 times the volume of gas as the physical

volume of the cylinder due to the high pressure!

The patented **GSS** stores over 80% less gas than typical shielding gas hoses. In addition to the wasted gas (which you can hear when you pull the torch trigger) the high flow also causes air to be pulled into the turbulent shielding gas stream! This is like starting with the gas cylinder shut off! You have probably experienced that before when you forgot to open the valve!

It takes a short time for the shielding gas flow to return to a smooth less turbulent (laminar) flow even when the start gas surge flow reduces. That can take several seconds so when making short welds or tack welds you're not getting all the benefits of the shielding gas you're purchasing!

**SUMMARY:**

The **GSS** can cut your gas use in half or more. It also has a surge restriction orifice built into the fitting at the welder- wire feeder end. That limits peak flow (*but not your set flow*) to a level that avoids excess turbulence for better starts. It allows a controlled amount of shielding gas to quickly purge the weld start area.

**Just replace the exiting gas hose from cylinder regulator to welder with our patented GSS. It is available in various lengths at [www.NetWelding.com](http://www.NetWelding.com)**

See more testimonials at: [http://www.netwelding.com/products/on\\_test\\_results.htm](http://www.netwelding.com/products/on_test_results.htm)

Have questions?  
Email us at:  
[TechSupport@NetWelding.com](mailto:TechSupport@NetWelding.com)