

Quotes from the Past...

As we contemplate our future



FOUNDED 1956

The following passages and quotes were gathered during historical research for a timeline to commemorate the 50th year of Richard Muther & Associates.

As leaders in industrial engineering, we have spent our careers learning what works and what doesn't when it comes to eliminating waste, reducing costs, improving productivity and increasing effectiveness. We have been doing this long enough to recognize that much of what is offered by our profession is often old wine in new bottles. Occasionally, something new is added and our field is advanced. And thanks to computers and software, we have many new analytical tools. But the basic principles and tactics have remained largely unchanged for the past 100 years. We continue to learn from and apply the lessons of Scientific Management, Fordism, Line Production, and what was called for a time "Know-how management."

Much if not most of what is prescribed today under the label of Lean Manufacturing or Lean Thinking can be readily found in the writings of early 20th century industrial engineers and managers, and in practices ascribed to Ford and other automotive companies between 1910 and 1940. Most of these practices are well described in Richard Muther's first text: Production Line Technique, which appeared in 1944 and was based in large part on a two year MIT study of the Detroit System of Manufacture. Similarly, the focus on measurement found in contemporary Six Sigma projects traces its roots directly to scientific management and its early emphasis on fact-based analysis of current conditions. Even the principles of "systems thinking" are evident in the early years.

I trust you will find what follows to be insightful and that it will provide you with useful reminders as you apply the time-honored principles of industrial engineering.

H. Lee Hales, President

Richard Muther & Associates

Consultants in Industrial Management and Engineering
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Taylor and Gilbreth on the mission and meaning of Scientific Management

"The principal object of management should be to secure the maximum prosperity for the employer, coupled with the maximum prosperity for each employee. The words "maximum prosperity" are used, in their broad sense, to mean not only large dividends for the company or owner, but the development of every branch of the business to its highest state of excellence, so that the prosperity may be permanent."

Principles of Scientific Management

- (1) Substitution of science for the individual judgment of the workman;
- (2) Scientific selection and development of the workman...instead of allowing the workmen to select themselves and develop in a haphazard way;
- (3) Intimate cooperation of the management with the workmen, so that together they do the work...

Frederick Taylor

The Principles of Scientific Management, 1911

The One Best Way

“The ‘one best way’ is the best way that is known, or can be discovered, at any moment of consideration. It is not an ultimate best way but is in the line of progress and may be changed or modified immediately (when) a better way is discovered. The new way then becomes the best way until it in turn is superseded by something better than itself. To the one who accepts and applies this philosophy comes the grace and rhythm and perfection of motion of him who knows and knows that he knows, and does what he knows, no matter what his work may be.”

Frank Gilbreth

Motion Study, 1911

As quoted and paraphrased in L.P. Alford’s

Principles of Industrial Management, 1940

On the misunderstanding of Scientific Management (and perhaps other initiatives)

“Many a false prophet will come to the business men, bringing only the shell of Mr. Taylor’s methods and not the principles, just as when the first general introduction of business system brought in its trail of heterogeneous assortments of cards, filing cabinets, and record sheets that involved endless clerical labor to operate and which in many cases constituted useless red tape.

“For a period, business men mistook form for substance; they believed that in the filling and filing of blanks they had ‘system,’ and ignored the real system of which these forms were merely the mechanical tools. The result was that this mechanical routine was either stripped of its non-essentials until it became a serviceable implement or was discarded entirely for the old fashioned inaccurate rule of thumb method.

“A system is not a card or a filing cabinet; it is the right way of doing a thing. Similarly, Mr. Taylor’s method of scientific management does not consist of forms or charts or of sets of rules and regulations. It is a big policy of establishing after scientific study and research a standard way of performing each industrial operation with the best possible expenditure of material, capital, and labor. The forms and rules are merely the machinery by which the policy is applied.”

Frederick Feiker

“What Scientific Management Is”, in How Scientific Management Works,
the System Book Company, 1911

Harrison Emerson on efficiency and its importance

“Efficiency does not consist in extreme effort, but in the elimination of undesirable effort and waste of all kinds...”

“Efficiency means that the right thing is done in the right manner, by the right men, at the right place, in the right time.

“True efficiency means ameliorating conditions for the worker, both individually and collectively – not only for the worker, but also for the employer -- not only for the employer but also for the corporation, *and* finally for the nation.

“The stone, spear or sword was distinctly an adjunct to primitive man, but just as distinctly modern man is an adjunct to the machine tool, to the locomotive, to the twelve-inch gun. We would use them automatically if we could, and dispense with the man, even as we now drill oil and gas wells two-thousand feet deep and dispense with the well-digger. Having reversed the relationship of worker to his tools, we must of necessity reverse the relation of officer to private, of official to employee; we must reverse the administrative cycle. The employee no longer exists merely to aggrandize and extend the personality of the employer, but the latter exists solely to make effective the totally different function of the employee.

“A competent librarian acts as an intermediary between all the knowledge of the universe collected in books, and the great miscellaneous reading public seeking information. An efficiency engineer ought similarly to act as a funnel, being equipped to gather from all available sources whatever is of operating value for the organization he is advising.

On The Cure of Wastes

“The ideal of the Twelve Efficiency Principles is waste elimination, and to this end they have been formulated...

“It has often happened that in industrial plants where high efficiencies were being obtained, visitors confounding system with efficiency have come, have collected devices, cards and forms, have gone away supposing they had the secret of efficiency. It is as if a man should appropriate a lawyer’s library and think this made him proficient in the law. There are millions of devices, forms, cards; no one can grasp them all, understand them all, and the chances are that not one of them will exactly fit in an untried place, even as no eye-glasses exactly suit any other pair of astigmatic eyes.

“When, however, all the devices and methods can be collected under a few heads – ten, twelve, fifteen; when it is possible to show that a few principles cover all the possible devices – then the thinker can work backwards and ask himself what devices or methods or plans he has that will maintain (for instance) ideals, or that will give him reliable, immediate, and adequate records.

“It is easy to test the efficiency of a plant because inefficiency is due to one of two causes. Either the principles of efficiency are not known, or they are not applied.

“Having ascertained what is, having set up standards, the plant manager and his counselors ought not to go out and collect forms and devices and cards, ought not to install clocks and devices and checks, systems and methods, but ought to go into retirement and search their own minds and hearts and by some device or method test the extent to which they can apply principles.

“The questions are not as to the number of employees, or whether the buildings are brick or wood, the equipment old or new, the employees men or women, white or black, free or unionized, nor where the plant and what the product is; but the first question is, ‘What are the ideals?’”

Harrison Emerson
Twelve Principles of Efficiency, 1911

Emerson's Twelve Principles of Efficiency

1. Clearly defined ideals
2. Common sense
3. Competent counsel
4. Discipline
5. The Fair Deal
6. Reliable, immediate and adequate records
7. Dispatching
8. Standards and schedules
9. Standardized conditions
10. Standardized operations
11. Written standard-practice instructions
12. Efficiency reward

Harrison Emerson
Twelve Principles of Efficiency, 1911

On the beginnings of participative management

“The era of force must give way to that of knowledge and the policy of the future will be to teach and to lead, to the advantage of all concerned.”

Henry Gantt
Industrial Leadership, 1916

C.U. Carpenter on “ownership” of ideas and improvements

“Many systems and methods, good in themselves, have utterly failed because the man that introduced them could see only ‘his system’ and he tried to bend and fit the factory *to his system* instead of shaping and fitting his systems to the factory conditions.

“Many a system’s expert has tried to install an elaborate and expensive system in a shop without sufficient regard to the wishes and suggestions of the factory men *and as a consequence of this he gained for it their enmity.*

“...when considering the introduction of new methods, call (the foremen) together and explain fully the plans to them. Tell them that these methods are designed to help them...and that they are not to be used to check them up and detect their previous shortcomings. Give them a chance to learn of methods used in shops other than their own. Give them the best of libraries – encourage them to meet and talk over matters. Give them a chance to learn and watch them grow.

“GIVE EACH MAN PERSONAL CREDIT AND RECOGNITION FOR WHAT HE PLANS AND DOES, AND WATCH THINGS MOVE.

“You may depend on it that these men have real brains, so give them a chance to show it. If you do, Mr. Manager, you will have some big surprises coming to you when you find some who are fully as smart as you.”

C.U. Carpenter (Disciple of Taylor, Gantt, Emerson, Barth and Knoeppel)
Increasing Production and Decreasing Costs, 1920

On Work Simplification (The Lean-Sigma program of its day)

“The person doing the job knows more than anyone else as to the best way of doing that job, and therefore is the one best fitted to improve it.”

“Work smarter, not harder.”

Allan Mogensen, developer of the Work Simplification Program of Continuous Improvement, 1934

“Participation by the worker in developing the method eliminates and cures many causes of resistance and assures enthusiastic acceptance. This may be more important than all the techniques put together.”

Ben S. Graham, developer of paperwork simplification. 1958

On the simplification of operations

“Those of us who have cleaned house and have gotten our factories upon a real modern management basis have been astounded to find out that these wonder-working methods are so simple; are so full of common horse sense; do away with so much useless system instead of introducing more of it; that they make it possible for the management to *really control* and *direct* the business in all of its details and thus to force their shops to meet the requirements of LOW COST, BIG PRODUCTION, HIGH QUALITY, SATISFIED LABOR.

“How has this been accomplished? Simply by recognizing the fact that the big difficulties that hold back the shop and cause such costly delays are brought about by little troubles that were not promptly attended to when they cropped out; then *planning* to catch these little ones when they show up and conquer them *instantly*.

“The result of a real searching investigation into the causes of delays (if you do get the truth) is always enough to make a management ashamed of itself. They will find that most of their shop troubles, delays, and loafing arises from materials not ordered in time or followed up by Stores and Purchasing, lack of tools and tools and machinery out of repair, lack of accurate knowledge of what outputs should be secured from machine tools and operators, no system of control over the flow of parts through the shop, poor management leaving control of the operators too much in the power of foremen...

“Modern production engineers all know from their experiences that American factories on the average are operating on a basis that is far below their full production capacities.

“From the past few years of striving have arisen management and production methods that are models of simplicity, directness, and effectiveness. Methods that strip away from industry the red tape and bewilderment of complicated systems!”

C.U. Carpenter
Increasing Production and Decreasing Costs, 1920

On the benefits of the Progressive Method of Manufacturing

(Layout by “value stream” around groups of parts and products, and flowing continuously from first to last operation; also called line production).

“The moment this plan is effective a great change will come over the shop. Instead of their being separate departments for each type of machine tools, there are separate departments for each part of group of parts. A foreman will have charge of the full production of one part or group involving a number of different machine tools. He is, therefore, responsible for the complete product of that one part.

“The parts must be perfect. It is all arranged like a train of gears. They must all operate together. There is usually no room for an accumulation of parts. The instant any one of the operations lessens its standard output, just that moment does the stock begin to pile up back of it and the department ahead of it begins to run out of parts. A roar will soon arise from each... of the departments before and after the one causing the trouble. Under some conditions an allowance may be made for a small accumulation of parts between some operations, but generally better results will result from the plan outlined.

“No sub-foreman can possibly hide any failure. It shows up *at once*.

“There is probably nothing in all production methods that will so increase the output, release tied up working capital and relieve the entire force of superintendents and foremen from worry as this will.

“It will eliminate the need for system and its attendant expense to a large degree. There would be no great need for a mass of production reports; costs are greatly simplified; stock tracing amounts to little and each machine is *forced* to operate up to its standard output.”

C.U. Carpenter
Increasing Production and Decreasing Costs, 1920

C. E. Knoepfel on the importance of visual management of performance.

“Certain it is, we will not produce efficiently without wise management, and we cannot have wise management if it decides unwisely and executes inefficiently. It must use something as its basis. This basis is knowledge. It cannot reason properly from detached elements, or related factors considered separately. Hence it must use coordinated knowledge. The problem is the means to of portraying this coordinated knowledge.

“Will it be figures, dry and uninteresting, or vast arrays of forms, complicated and difficult to coordinate, or compilations of statistics which must be studied hard to comprehend? Or will it be graphic presentation, so that, paralleling the observation of time, we look at the watch and at a glance note the time, instead of receiving a card saying “23 minutes past 7?”

C.E. Knoepfel, Consultant
Graphic Production Control, 1920

On Know-how management -- extolling the management practices and methods of Henry Ford and the automotive industry as an alternative and successor to scientific management.

“Scientific management insisted fundamentally on a definite segregation and specialization of the thinking phases of management and provided the ‘functional foreman specialist’ and later ‘specialized staffs’ and ‘experts.’ Know-how management welcomes thinking by all members of the organization and provides such arrangements that their ideas can be made known and considered by the manager and also applied if they are good (effective suggestion systems, employee-management meetings, improvement sessions, and rewards).

“Know-how management recognizes that in order to accomplish any kind of work in the most effective way, four distinct procedures must be applied. They are:

1. PLANNING
2. ORGANIZING
3. OPERATING
4. SUPERVISING AND CONTROLLING

“Know-how management stresses PLANNING AND ORGANIZING as the most important of all management procedures and does not concentrate primarily on OPERATING AND CONTROLS as does scientific management.

“Know-how management thinks, plans, operates, supervises, and controls in terms of GROUPS. It recognizes the importance of the individual and his abilities, but it aims from the very start to have the entire management and all men and each manager and all his men work as one group.

“Know-how management encompasses ALL WORK FACILITIES and ALL WORK METHODS into the fundamental scope of management, and it coordinates all men, facilities, and methods into the most effective work groups, all of which are considered as equally important for the progress of the company and all concerned.

“Since in our day about 90 per cent of all production work is done by machines, equipment, and other facilities... know-how management plans, organizes, operates and supervises in all these terms, not only in terms of administrative men... coordinating all the basic elements which are needed to get any kind of work done...”

“The greatest shortcoming of time study as now performed... is that it concentrates attention on work times and determines them correct to the decimals of 1 minute while it most often overlooks the idle times that are the real cost-creating and time-delaying factors and thus the most wasteful portions of operating.

“Idle times related to “work times” show ratios of 3 to 1 in the best operated and fully mechanized automobile plants and thirty to forty times more “idle time” than work time in many small plants if the entire “production time cycle” is considered. This is the time from receiving the material to the date of delivery in the form of finished products.

“The...manager, aiming at best operating, would need exact data on the idle times much more than exact data on work times, because by studying and taking proper steps to eliminate the idle times he could really save.”

Edward Hempel, Editor,
Small Plant Management, A Practical Guide to Know-How Management, 1950

Summary of Know-How Management’s principles for plant operations
(by Adolph Ehbrecht, Gries Reproducer Corporation, Bronx, NY, 1950):

1. Good operating can actually be achieved only if *preceded by good top-management planning and organizing.*
2. Careful *program-making* must be applied for all the detail work to be done.
3. Detail operation planning based on continued *study of operation* details and process phases must aim to find the best methods of doing the work.
4. The execution of work plans should be based upon machines and methods rather than upon men.
5. *Coordination of machines, methods, and men* should aim to *eliminate all wastes.*
6. A best suited *system of work and operating* should gradually be evolved.

On Fordism – the ideals and principles embodied in Ford manufacturing plants

The Ford Ideal – Higher Standards of Living

Requires: <ul style="list-style-type: none"> • Better education • Better housing • Better health • Better recreation • Better food • Increased use of goods and services 	And is Derived from: <ul style="list-style-type: none"> • Lower production costs • Increased labor efficiency • Improved industrial safety • Elimination of wastes • More efficient use of capital • Improved transportation • Improved control of power • Substitution of power for human drudgery 	And Aids Toward: <ul style="list-style-type: none"> • Shorter working hours • Higher wages • Increased production • Efficient distribution
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“The country’s welfare rises or falls with the position of the wage earner. The expenditures of the rich cannot support any basic business in this nation; for in the first place we have very few people who can be called rich; and in the second place, neither their needs nor their buying power is sufficient to support even a medium-sized industry of any sort. The largest, most varied and most constant market in the world is the wage-earning American people. They handle the bulk of the money; it is their needs and standards that keep the wheels turning.”

Henry Ford, quoted in Ford Production Methods, 1936

Objectives of Ford Material Handling Methods, from Mill & Factory magazine, 1936:

<ul style="list-style-type: none"> - Expedite inter-plant movement of parts. - Synchronize production by departments. - Control rate of production. - Eliminate unnecessary movement of materials and parts. - Move materials and parts with a minimum of manual assistance. - Prevent strains and accidents to workers. - Avoid non-productive employment of labor. - Provide accurate control of production. 	<ul style="list-style-type: none"> - Insure delivery to proper destination. - Prevent accidental damage to parts in movement. - Avoid delays of machine operations due to waiting time. - Conserve floor space. - Provide for automatic cooling and cleaning of parts. - Prevent excessive stock storage of semi-finished and finished parts. - Expedite accurate scheduling.
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On the importance of plant layout

“Closely associated with the study of methods, machinery and materials, yet somewhat isolated from them, is the problem of plant design and layout. In an integrated program of cost reduction, the industrial engineer immediately comes to the problem of energy wasted in moving the material unnecessarily during the manufacturing process... Keen minds able to think analytically and synthetically are necessary to do a good job in plant layout. Tremendous savings have been made by this branch of industrial engineering and the job can never be considered finished.”

Professor Charles Koepke, University of Minnesota
Plant Production Control, 1941

Christy Borth from Masters of Mass Production, 1945

(A good description of RMA consultants to this day)

“They are not of the starched-shirt breed, nor of the breed called ‘stuffed shirt.’ They are most at home in some cubby hole out in the factory, where talk is usually out of the question because you can scarcely hear yourself think amid the din of roaring machines... Sometimes, but not often, you may catch one of them in a conference, registering itching discomfort in the paneled and upholstered quiet of a board room. But when the smoke of Coronas grows thick and the talk becomes almost as cloudy, such a conference-trapped one is more likely to jump to his feet and say. ‘Hell’s ringing bells! We’re not getting anything done with this talk. Let’s get out in the shop!’

“The belief that production is the key to the more abundant life is ...largely the result of what free Americans have accomplished in their mastery of mass production. It is America’s gift to the world.”

On the importance of increasing the industrial efficiency in the United States

“Industrial supremacy is largely a function of the character of the population. If the people of India or China were as competent, from an industrial point of view, as England or the United States, there could be no question as to the race with which ultimate supremacy would lie, assuming the possibility of maintaining the conditions other wise the same. All production is more or less a function of labour, and as the nominal cost in the eastern countries is about one-twelfth the cost in the industrial centers of the United States, the race should be to the “Chinese cheap labour” if it were sufficiently effective.”

J. Stephen Jeans, "The Shifting of National Industrial Supremacy,"
The Engineering Magazine. April 1898.

“...commercial clash between nations, between industries, and between concerns in the same industry; class strife; revolutions in ideas and ideals; the race between the high cost of living and the cost of living high; the sparring between capital and labor, all point to one thing – a kind of warfare which can be called social, economic, industrial, or by any other name you choose, but a warfare which will be won only by that nation giving due consideration to proper coordination of the elements involved. The trade of the world will go to that nation which is the most prosperous. The nation which is most efficient will be the most prosperous.”

C.E. Knoepfel, Consultant, 1920

Looking ahead...

Richard Muther on the importance of planning

“Before you go somewhere, you should know where you are going. Unless, of course, you *want* to get lost. For some, there is a certain thrill of the chase, a kind of ‘let us get out of this by doing something exciting or clever.’ Some people are risk-takers who...subscribe to the adage, ‘He who hesitates is lost.’

“But most of us find more value in the proverb, ‘Look before you leap.’ Why? Because planning avoids all the added cost, wasted time, extra effort, frayed nerves, and sometimes irretrievable lives that “getting lost” can mean.

“As the world becomes more complex, we need to plan better. More is at stake. A high price is paid for things that turn out bad, unreliable, or illegal. There is a greater need to integrate people, time, places and things. There is a greater need to make decisions faster and better. There is a greater need to provide sound direction to subordinates – both planners and doers. And the pace of all this is increasing in our rapidly changing society.

“If you learn a procedure for planning, how to use it, and then apply it more-or-less from habit, you don’t have to worry about how to approach your planning efforts.”

Richard Muther
High Performance Planning, 1988

“In the 1900s, we were tooling-up whole industrial plants to fit together. We were developing engineers and mass production plants.

“In the 2000s we are discovering how to tool-up the process of planning so the elements of projects will fit together into effective plans. We are now developing PLANNERS and ways to make better plans.”

Richard Muther
Planning by Design, 2005

“Planning will be the demand skill of the 21st century.”

Richard Muther