

The need for, origin, development and application of MTM.

A message that Harold B. Maynard addresses to MTM students at the Methods Engineering Council in Pittsburgh. (ca. 1950)

Note: This text has been translated back into English. We are recommended for the original text!

I THE NEED

Very many people nowadays claim that the problem of human posture in industry is the most important issue. Speaker after speaker urges his audience to pay more attention to the human element in the industry.

They say that technical progress has surpassed social progress, and that we need to improve our human relationships, if we want to benefit from the material advantages that technical progress can offer us.

This is all genuinely nice, and anyone who understands today's problems of the industry will admit that these things need to be said. The difficulty, however, is that most speakers speak in general terms. They work on our feelings. They can impress all of us with, the better human conditions in the industry, but most of them do not tell us how to achieve this. The inevitable consequence is that our internal urge to do something disappears due to a lack of means to comply with it, and a short time later we are back at the point of exit.

Now I do not want to claim that MTM could provide the answer to all the human difficulties in the industry. That would be foolish because it is not true. But it is interesting to note that the MTM system was originally designed in response to the observation of the human problem. It was designed more to solve this humanitarian problem than to solve a technical problem. And as we will now see, it not only solved the problem that was originally identified, but also several other human problems.

The way in which the problem was dealt with was essentially rational and I would like to elaborate to point out that this is also, in my opinion, the only way that is possibly capable of solving our human problems. In this way it is all about getting the facts. When we have facts to work with, solutions to these problems come to light.

I said its origin was a human problem. You can read something about it in the book *Methods-Time Measurement*; but let me tell you something myself. The work of the labour analyst that should come to the fore is to improve working methods. Almost everyone nowadays realizes that we have acquired our high standard of living by producing things in a shorter period. Not only are we able to provide us with all the necessities of life - and what we have come to regard as necessities of life - but we can acquire many more things if we want to. And in doing so, we work in a short time and have more and more free time to enjoy ourselves with our material creations.

All this is made possible by better production methods developed by all kinds of engineers. This is openly acknowledged, and one often sees articles in magazines and newspapers praising the progress of engineers.

Nevertheless, a labour analyst usually encounters a lot of opposition when he comes into a factory and proposes an abundance of practical solutions to improve a working method. This is especially the case when he tries to change the sequence of the worker's movements without making any further major changes to the workplace.

There are several reasons for this; fear of loss of security, or the idea that one will become superfluous by doing the work more quickly, as there is only a limited amount of work to be done.

These feelings can be countered by guarantees that the worker will be able to remain in the company, by giving the worker a sense of economy, etc. But then we will still experience a certain resistance to the new ways of working, so that in the end we must conclude - and this has been known for centuries - that human nature resists change.

When this is the case, the labour analyst, in his search to improve the working method, i.e. by replacing the old method with a new one, does something that goes against the deepest instincts and tendencies of the worker. His work, which is of inestimable benefit to mankind, at the same time causes human problems which, as far as possible, should be avoided.

When examining what a labour analyst does, when he is working a method improves, we see that he usually corrects the working method instead of building a working method. He studies the working method that already exists and tries to improve it by correcting the imperfections he finds. He is forced to do this because he is usually not touched by the work before production is already underway. Thus, he is always given the role of a critic, who must criticise the working method established by the foreman, the worker, or others, and then he starts to do things that go against human tendencies not to change.

It would be much better if he could study the method of working before it is put into practice was put into practice. There are seldom difficulties when the method of performing a task is introduced for the first time. Therefore, industrial relations will be significantly improved when the first working method is efficient, so no subsequent changes are necessary.

However, if the labour analyst is enabled to determine best practice before it is put into practice, he must have better tools at his disposal than the motion and time study. The movement study lacks the essential element: time.

Of course, time *is* considered in the time study, but this in turn requires that someone does the work, can be applied for the time study. What the labour analyst therefore needs to study and develop a method of working before it is put into practice is a system that can tell him how long each series of movements he devises will last without first having to teach a worker the work so that he can then follow it and de-terminate the time on the basis of a stopwatch observed..

II THE RECOMMENDATION

With such a system, the labour analyst would finally move away from correcting working methods and move on to the actual labour studies. The result will be that one of the causes of unrest in the industry will be eliminated.

This was the reasoning that led to the development of the MTM system. It was developed with the basic idea of improving industrial relations in the industry. We will now see that experience has shown that it fulfils this task.

Once the need for a system such as MTM was established, the next step was to develop it through research. Of course, it was not yet possible to imagine what the final shape of the system would be.

In the beginning, we only knew that we wanted something that would allow us to develop best practices without the need to make movement studies of an already existing work. The first idea about the direction in which the system could develop came naturally. We were able to avoid making time studies of certain types of work by developing time formulas. A time formula is a composition of time study

data, *which* makes it possible to establish a time standard without making a detailed time study. It was very natural that we started thinking about developing a work method formula that would make it possible to develop a work method without making a motion study of an existing chore beforehand.

This was our plan. We first decided to try to find a formula for a table drill. We made film recordings of working with table drilling machines in different factories. The films obtained were studied very carefully. In fact, we studied every inch of film three times in a row, before taking a direction that turned out to be wrong. Finally, we managed to develop a set of data with which we could accurately determine the hand time for each method of operating tabletop drill, which we can imagine. The method formula was born.

In Pittsburgh at the MEC you can still find this first stored method-formula. It is only of historical value, because it was never used. Because the idea of the method formula was abandoned almost immediately when the first method formula was complete and for noticeably clear reasons. On 12 December 1941 we were already investigating the application of the method-formula, when finally, something became clear to us that we should have noticed much earlier. But we had not seen the wood for the trees.

III THE DEVELOPMENT

When we developed our method formula, we had not studied the work of a tabletop drill, but instead had studied movements and how they were made. Once we realised this, we saw that we had developed a set of method-time data that we could apply to any kind of work that involves hand movements. It would not be necessary to develop method formulas for drilling machines, lathes, punching machines and assembly work. The same set of method-time data applied to all of them.

When the method-time data was finally developed, we had reached the goal we had set ourselves.

We had created a tool that opened the possibility of developing best practices before production started. In this way, our search for something that would improve human relations, insofar as this lies within the power of labour analysis, had succeeded. Success was indeed beyond our initial expectations and so grandiose that what has been achieved overshadows what was originally stated.

The MTM system made it possible to set production standards without using a stopwatch. Now it is not the case that there are any objections to the stopwatch. It is only a means of measuring time.

It is used to get objective figures about time instead of subjective estimates. Nevertheless, the stopwatch has been abused to such an extent by so-called efficiency experts, by people from the hunting system and by tinkerers who didn't quite know how to use it, a prejudice against it has undeniably arisen all over the world. Taking time studies with the stopwatch is an extraordinarily useful way of working, which produces excellent results when done right. Wherever the times of machines or processes need to be measured, it will be used.

At the same time, it is too obvious that any system that makes the use of a stop-watch superfluous will give a significant improvement in human relations. And if at the same time the system eliminates the necessity for the labour analyst to estimate how fast or how slow he believes the

worker works, then indeed one of the main causes of the human problem will be eliminated in labour analysis.

And this, of course, is exactly what the MTM system does. It is certainly a technical thing, a tool for business organization, but it is also of practical importance for human relations in industry. After all, it is the kind of development that will lead us to better human relations in our work. Although from now on we are going to talk about technical things, in this opening word I wanted to emphasize the human aspects of the system. They are especially important.

IV AREAS OF APPLICATION AND RESTRICTIONS

DESIGNING EFFICIENT WORKING METHODS BEFORE PRODUCTION STARTS

One of the main advantages of MTM over orthodox time and weighting techniques is that, with its help, the most efficient working methods for the processing, transport and control of a new product can be designed before it is produced. By imagining the different necessary operations, transports, and controls, an experienced MTM analyst can design the movement patterns, according to which the operations must be performed. Knowledge of the shapes, distances, dimensions, fits, weights and quality requirements of product, material, machinery, tools and aids is required to determine the correct classification of the necessary movements. If more than one working method is possible, the sum of the times of the elementary movements will give a definitive answer as to which method is the most efficient.

In addition to the most efficient working methods, the standard times for the various operations can thus already be determined before they are carried out in practice, enabling an exact cost calculation to be made.

In addition to the major economic benefits for the company, attention must also be drawn to the improved human relations that this creates. Changing existing working methods encounters psychological reluctance on the part of both executives and supervisory staff, which has repercussions on human relations within the enterprise, which can be prevented by designing working methods which are as efficient as possible in advance and which need practically no further modification at a later stage.

Instruction in the new working methods is also facilitated and accelerated by using the detailed work description of the pre-defined movement pattern.

V IMPROVING EXISTING WORKING METHODS

As long as the industry and elsewhere are still working according to working methods that have not been designed as efficiently as possible in advance, there is still plenty of opportunity to improve them by critically assessing the movement patterns that have been created using MTM.

By studying a work act movement by movement, where the correct time is known for each movement, as well as for any other movement that could replace it, it is practically always possible to develop a work method that improves the existing work method. The savings to be made with the introduction of the new working method can be implemented immediately.

VI SETTING TIME STANDARDS

By assigning to each movement necessary to carry out a work operation the standard time determined in advance, the standard time of the entire work operation is obtained by adding up.

If the correct allowances for personal and business losses are added to this standard time, the time rate for this labour operation is created, which can be used for the application of a certain remuneration system, production planning and cost price calculation.

MTM thus makes it possible to set rates without the need to stand behind the worker with the stopwatch in his hand to measure his labour operations and assess the intensities with which he performs them.

In addition to the advantage for the labour analyst of being able to omit such difficult and subjective immensity estimations, this also means a psychological advantage for the labour force, which benefits human attitudes within the company.

THE COLLECTION OF BASIC TIMES AND THE COMPILATION OF TIME-FORMULES.

Even when applying the orthodox time study techniques, every good labour analyst strives to collect basic times of corresponding work actions on similar or different products and to draw up time formulas in which he can process these basic times into tariffs for not-yet-earned hours. of the recorded operations on various products.

When applying orthodox time study techniques, however, this is a time-consuming work that will only yield results after years of collecting the necessary basic times. When applying MTM one achieves these results much faster. By drawing up the correct movement patterns for the various work activities required, one can immediately see the influence of the various variables on the movement pattern and therefore also on time. For the determination of time standards for non-repetitive work activities, such as in construction workshops with single or very small series production, MTM is the only method with which one can determine the required basic times and draw up time formulas, graphs or tables in an economically responsible manner.

DESIGNING THE MOST EFFICIENT SHAPE AND CONSTRUCTION OF PRODUCTS, MACHINES, TOOLS AND AIDS.

Most designers and constructors of new products and of machines, tools and auxiliaries with which they are manufactured are not sufficiently aware of the influence their designs have on the movement pattern of the operations with which they are to be manufactured or operated.

By using MTM, by the manufacturer himself or by the labour analyst who assists him with this, a representation can be formed of the movements that are necessary to carry out the work operation in question. By assessing these movements and their associated norm time and critically, a design can be created that requires a minimum of movement and time for the labour operations with which it is to be manufactured or operated.

THE INSTRUCTION OF EXECUTIVE AND SUPERVISORY STAFF.

The working method, dissected and recorded in motion after motion in or-

der to carry out a certain work operation as efficiently as possible, is a very useful tool to teach the worker how to carry out the work operation as quickly as possible.

Knowledge of MTM by the instructor or supervisory staff in charge of instructing the worker can be of great use to them in carrying out this part of their task. In general, MTM can help to make the supervisory staff more method- and movement-aware.

RESEARCH IN THE FIELD OF WORK TECHNOLOGY.

Many problems that *cannot* be solved using orthodox time and method study techniques can be brought closer to their solution with the help of MTM. For example, it is a long-known fact that the main difference in work performance between different workers is caused by small *differences in* the method of performing the work. However, how much these differences can amount to can only be accurately determined with MTM.

RESTRICTIONS IN THE APPLICATION OF MTM.

Although in many areas MTM can be applied just as well and even better than the orthodox time and method study and also leads to results in cases where Orthodox techniques fall short, however, there are some areas in which MTM cannot be used.

Determining pure machine times and pure process times, for example, cannot be done with MTM. For this, the stopwatch or calculation from known technical data remains the appropriate means. MTM also falls short when determining the time *for* human movements, which are entirely or largely determined by a chemical or physical process. Examples of this are painting a surface using a brush or a paint sprayer. The speed at which the hand that wields the brush or sprayer moves is *entirely* determined by the speed at which the paint runs from the brush onto the surface to be coated or the speed at which the paint leaves the sprayer and the *quantity of paint* to be applied per unit area. No time standards can be set using MTM for work activities where thinking time takes precedence over the time in which the hands carry out their work. Other activities, for which setting time standards using the stopwatch has been a problem for many years, such as various surface treatments in the metal and other industries, also pose a number of problems for the application of MTM, the solution to which requires a thorough study.

However, MTM is more likely to get to the heart of the problem, which in the case of these surface treatments, for example, lies in the frequency with which certain movements or an assembly of movements have to be carried out.

MTM therefore does not make the use of the stopwatch entirely superfluous. However, the labour analyst who masters MTM does have a clear advantage over his more classically trained colleague. The knowledge of MTM forces the labour analyst to be, as it were, always aware of the laws of movement economics.