

# MTM PERFORMANCE RATING SCALES

*Investigate the usage of performance rating with a view to producing a guide to the comparability of different systems/scales*



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GC 2007-10-15

MTM\_Performance\_rating\_scales

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## **INTRODUCTION**

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Many work measurement techniques make use of performance rating to ensure that times calculated or derived are times for 'an average qualified worker' to carry out the work being measured. Since this average qualified worker is not actually observed, performance rating is used to modify what is observed and thus convert it to 'basic time'. Some measurement techniques such as pre-determined motion-time systems (PMTS) do not require the observer to rate the worker being observed, but such techniques have used performance rating in the derivation of the data which is applied to the observed motion pattern. Thus performance rating is an integral part of work measurement.

Unfortunately there are a number of different performance rating systems and scales and this makes it difficult to directly compare standard times derived by different methods or in different organisations.

## **THE PROBLEM OF COMPARISON OF ALTERNATIVE SYSTEMS/SCALES**

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Increasing globalisation of large companies means that many organisations are now using a number of different work measurement techniques in different parts of the organisation. This happens because different techniques have assumed a greater degree of usage in particular countries.

These global organisations are now looking to establish compatible (or at least comparable) time standards across the organisation to simplify planning and control processes.

The IMD collected published material from across Europe on rating systems/scales. Most of the material is very old (from the 40s, 50s and 60s) and there appears to be virtually no effective research on performance rating being published at the present time.

The material referring to the comparison of different rating scales shows no evidence of empirical research - it is therefore difficult to give an authoritative comment on the use and transferability of rating scales.

The earlier material contains several discussions on alternative rating systems. Presently MTM data is based on the LMS System (first published in 1927 by Lowrey, Maynard and Stegmerten) but most current time study based rating is carried out using 'local' (BSI, REFA, MTM) rating scales. Many of these scales are very similar although they go under different names.

Using an MTM equivalent rating scale does allow such cross-checking on the basis of MTM analyses and thus offers a more effective means of

both training and rating checking (via rating clinics) than one of the more usual systems of comparing an observer's rating with the mean of a panel of his peers.

Each of the rating systems/scales starts from a different conceptual viewpoint. The Bedaux System (now little used) assumed that 'normal' performance was 60 'minutes of work' per hour, that 80 'minutes of work' per hour was incentive performance and that 100 was a theoretical maximum.

All work measurement systems use time units to represent work content - the quantity of work involved in carrying out a particular task, operation or job. Thus the unit, such as 'standard minute' is an expression of quantity of work, rather than of time. It only converts to an equivalent time assuming that the operator works at standard performance (on the performance rating scale used) and takes the agreed level of allowances built into the work content value.

Different rating Systems claim to rate different factors - commonly these are some combination of speed, effort, skill, dexterity, consistency, conditions.

One of the common problems of rating is that it is often linked to remuneration, through the setting of 'daywork' rates or through graduated incentive payment schemes. This results in pressure from employees and unions on work study practitioners to 'slacken' their ratings to give 'looser' time values for jobs.

Thus, even though the same rating system and scale is in use in 2 different organisations, there is no guarantee that the concepts of normal and incentive performance are the same in each - this is especially true if the organisations carry out no rating validation through rating clinics.

In some countries/organisations, trade unions have a right to observe time studies or to carry out parallel studies to check on the times produced by work study practitioners. Where incentive payment schemes are involved there is understandably a desire to challenge rating and allowances used by the practitioner - since most rating systems are based on subjective judgement, this debate is difficult to resolve in the absence of some means of validating ratings.

In many Countries this has been solved in part both by using MTM as a validating method and by using incentive schemes similar to traditional piecework schemes, where the final piecework rate is a combination of basic pay rate, the calculated time value and a negotiated local 'pay factor'. This ensures that negotiation centres on the pay factor rather than on the standard time (and by implication on the rating or on allowances built into standard times).

This separation of pay negotiations from standard time derivation is important if the times are to be useful for planning and control purposes - when comparability and consistency are important.

## PRINCIPLES OF EFFECTIVE RATING MANAGEMENT

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The discussions of IMD technical committee have resulted in the identification of the following principles to be followed if performance rating is to be fully effective.

1. Use an established rating system/scale.  
(If you are an international organisation, consider the use of the same scale across all parts of the organisation)
2. Train practitioners thoroughly in the use of the system/scale (and in all other aspects of the measurement process).
3. Implement a rating validation procedure.  
(e.g. by comparison of sample jobs with MTM values)
4. Explain the principles and aims of the measurement process to the workforce.
5. Ensure that standard times are not included in any negotiation process
6. Hold regular (and frequent) rating clinics for practitioners
7. Where different measurement systems are in use, ensure that standard times are issued to a common performance scale
8. Implement a System for auditing of standard times

## COMPARISON OF DIFFERENT SCALES

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Some attempts have been made to compare results derived from the use of different systems/scales. The following information is just a collection from various sources and it is not to be considered officially recognized by the IMD:

1. For example, in Germany a study was carried out in 1970 of a large number of jobs in the metal-working industry. All jobs were measured using time study (using the REFA scale), MTM and Work Factor (Basic Work Factor, not Ready Work Factor). Although there was variation in individual jobs the conclusion was that :

if REFA time is 1.0,

then MTM derived time                      → REFA time/1.05

and Work Factor derived time              → REFA time/1.11

(The study was carried out by INSTITUT FÜR ANGEWANDTE ARBEITSWISSENSCHAFT e.v. in Cologne)

2. British Standard BS3138 gives a comparison of the BSI scale with the Bedaux  
Scale which gives  $BSI = Bedaux \times 1.25$
3. Another often quoted figure for the BSI rating scale is that  $MTM 100 = 83$  or the BSI scale.

We have found no empirical evidence for this conversion, but it is in general usage and we can thus summarise this combined data as below.

A. Ratings (non-official data)

REFA	MTM	BASIC WF	BSI	BEDAUX
100,0	95,2	90,1	79,0	63,2
105,0	100,0	94,6	83,0	66,4
111,0	105,7	100,0	87,7	70,2
126,5	120,5	114,0	100,0	80,0
158,1	150,6	142,5	125,0	100,0

rating conversion factors compared to MTM are

REFA :	1.050
BWF :	0.946
BSI :	0.830
BEDAUX:	0.664

B. Times

Because of the differences in rating scales, times constructed under systems using the different scales are not directly comparable and must be converted. The form of conversion depends on the 'direction' of the conversion.

For example, to convert a time constructed using the REFA scale to make it comparable with times constructed using the MTM scale would require a conversion using the formula given from the German study referred to above.

i.e.  $MTM\text{-based time} = REFA\ time / 1.05$

and, conversely, to convert a time constructed using the MTM scale to make it comparable with times constructed using the REFA scale, would require the conversion :

$REFA\text{-based time} = MTM\text{-based time} \times 1.05$

Thus, one conversion factor (to move in one direction) is the reciprocal of the other (to move in the other direction).

One complication is the Bedaux system which 'normalises' to a base of 80 rather than 100 (as all the other systems do). This means that the conversion factor for Bedaux-based times is not the same as the (reciprocal of the) rating conversion factor. Thus, an additional factor must be introduced which makes BSI and Bedaux times directly comparable, i.e. a conversion factor is required to compare ratings but because the Bedaux system normalises to 80, no conversion factor is required to convert times ( $0.664/0.8 = 0.83$ ).

		FROM				
		REFA	MTM	BASIC WF	BSI	BEDAUX
TO	REFA		1,05	1,11	1,27	1,58
	MTM	0,95		1,06	1,21	1,51
	BASIC WF	0,9	0,95		1,14	1,25
	BSI	0,79	0,83	0,88		1
	BEDAUX	0,79	0,83	0,88	1	

(non-official data)

**Cautionary note**

We would not suggest that the conversion factors provided are 'absolutely provable' (and unfortunately we do not have the resources to verify them) but they are based on published information and they do offer a guide to the comparability of results obtained from different measurement systems and rating scales.

**COMMENTS AND CONCLUSIONS**

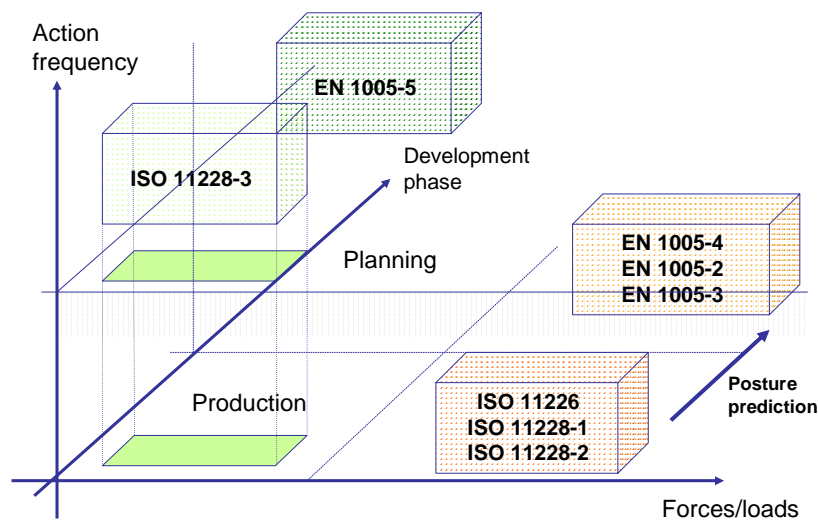
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1. MTM, Basic Work Factor, REFA (normal performance = 100) and Bedaux (normal performance = 80) are classified as 'Medium Task Systems' (they are all within ± 5% with respect to MTM)
2. MTM normal performance is recognized worldwide and it is considered as a fair level for setting basic times (it's neither low nor high level). In our numerous MTM application experiences, typical actual performance levels, measured upon the MTM scale by qualified international experts, range from 80% to 120% with a confidence level of 95%.
3. BSI scale is a 'High Task System' (+ 21% with respect to MTM)
4. From recent studies conducted to develop the ergonomic screening system 'European Assembly Work-Sheet' (EAWS), the MTM normal performance resulted to be in line with the most recent ergonomic standards related to biomechanical load:
  - EN 1005-2:2003 98/37/EC CEN/TC 122 2/13/2003

- Part 2: Manual handling of machinery and component parts of machinery
- EN 1005-3:2002 98/37/EC CEN/TC 122 11/8/2001
  - Part 3: Recommended force limits for machinery operation
- EN 1005-4:2005 98/37/EC CEN/TC 122 2/17/2005
  - Part 4: Evaluation of working postures and movements in relation to machinery
- EN 1005-5 98/37/EC CEN/TC 122 4060
  - Part 5: Risk assessment for repetitive handling at high frequency

That further confirms the concept of medium performance as opposed to both high and low.

Application fields



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5. The IMD overcame the concept of Standard Pace based on walking speed (e.g. walking level ground at 4 mph or 6.4 kph) or other standard actions. Indeed, during the development of the most recent MTM systems (UAS, SAM and MEK) a great emphasis was put on the definition of method level: the Method Level is the quality of work flow, depending on the worker's skill and the degree of organization of the work system. According to that concept, the same task can have a different normal pace as a function of the opportunity of

repetition and of the organizational level of the workplace. For example:

Walk 1 pace (about 80 cm)

MTM-1 basic time: 15.0 TMU

UAS basic time: 25.0 TMU (+66% !)

- The IMD recommends to adopt the medium task scale to define a fair performance level which does not exploit workers. Incentive systems should focus on productivity (performance is only one dimension) and other key performance indicators (e.g. profitability, quality, etc.) to support and achieve world class productivity levels

## Influence Factors of Productivity

### Productivity

**Method** x **Performance** x **Utilization**

**M** x **P** x **U**

Method has the biggest potential