

## Chapter 2

# Revision Method of Man-Hour Quota Real-Time Optimization Based on the Moving Average

Biao Meng and Xiewen Zhang

**Abstract** In view of man-hour quota standard is difficult to accurately reflect the production status, especially for emerging enterprises there is a big deviation problem in the mechanical model for discrete manufacturing enterprise. The quota standard can be gradually tended to reasonable state mainly from dynamic optimization aspects without considering the quota standard setting method. Based on the analysis and carding of man-hour quota integrated management process, a revision method of man-hour quota real-time optimization based on the moving average is put forward. And a kind of realizing method is elaborated that based on a specific data table structure. Finally, a plug-form quota management tools based on this method is developed, which is convenient to integrate with existing enterprise production management system.

**Keywords** Man-hour quota · Moving average · Optimization

## 2.1 Introduction

In certain production technology condition, a predetermined amount for the production units of qualified products or the completion of certain job labor consumption called the labor quota. This limited amount is the embodiment of a

---

B. Meng (✉)

Key Laboratory of Fundamental Science for National Defense of Aeronautical Digital Manufacturing Process, Shenyang Aerospace University, Liaoning, China  
e-mail: kongwan69@gmail.com

X. Zhang

Shenyang Jietong Fire Truck Co. LTD, Liaoning, China  
e-mail: zxw1568@sohu.com

number of standards. In the machinery manufacturing industry, the standard is usually to labor time scale, to processes for basic computing unit. The production units of qualified products or the completion of a certain task work time consumption quota is called man-hour quota.

The management of man-hour quota is involved to internal confidential and many sensitive issues, so consequently domestic it is not yet clearly defined in man-hour quota management area. But in fact, it is an indispensable part in enterprise management. It directly affects the product quality, production efficiency and economic benefits, and so on. It focuses on technical and managing work at the same time. The management of man-hour quota is the important basis in enterprise cost accounting, organization of production, personnel allocation, performance appraisal and distribution.

At present, there are many problems in the management of man-hour quota. Its development lags behind others, and the situation influences the accuracy and impartiality in enterprise management, as follows:

- Time quota formulation method is backward, and the quota is generally on the low side.
- The lack of effective quota data management and analysis.
- The current standard time lag in the development of enterprise productivity.
- The lack of computer aided man-hour quota Application level.
- The low integration of man-hour quota data.

Man hour quota result is difference with practical enterprise production condition greatly. It mainly reasons are the amount of insufficient data and the lack of adaptation of the revised by optimization method. Under normal circumstances, the result of the man-hour quota not dynamic response production capacity is caused by long hours following the early formulation of outdated production quota standard and collecting actual data cannot be dynamically revised quota standard [1, 2]. Based on the moving average man-hour quota real-time optimization revision method can constantly tend to reasonable situation after a certain operation cycle under arbitrary norm condition. It provides powerful tool for the enterprise quota management [3, 4].

## 2.2 Integrated Management of Man-Hour Quota

In general, if this is a new formulation of quota standard referrals using typical quota method, to the same type of product parts as the foundation, from which are representative of typical parts are selected. In the process of single units of time, quota standard is created according to the influence factors of duration variation and a typical production technology condition of the tissue [5]. That reduces the quota standard number and having an enable comparison, flexible, reliable and fast usage.

In order to facilitate the production and management system integration, this paper adopts the man-hour quota management plug-in software rather than a management system, can avoid the implementation of the system integration and data exchange and sharing problem. The plug-in can easily be integrated manufacturing execution system with standard man-hour quota and the measured time for input, than output optimized man-hour quota of new standard. As shown in Fig. 2.1.

### 2.3 Working Revision Algorithm with Real Time Optimization

Set up the collection of actual work time are  $h$ , moving average is  $m$ , man-hour quota is  $s$ , the optimized man-hour quota is  $s'$ , moving average parameters,  $n$  (i.e., moving average, the number of fixed standards), quota standard weights is  $w$ ,  $h_1, h_2 \dots h_n$  is the real time for early  $n$  times collecting actual work, than completes the optimization requires the following three steps:

$$\text{step 1 : } m = \frac{\sum_{i=1}^n h_i}{n}$$

$$\text{step 2 : } s' = sw + m(1 - w), \text{ That is: } s' = sw + \frac{\sum_{i=1}^n h_i}{n} (1 - w)$$

$$\text{step 3 : } s' \rightarrow s$$

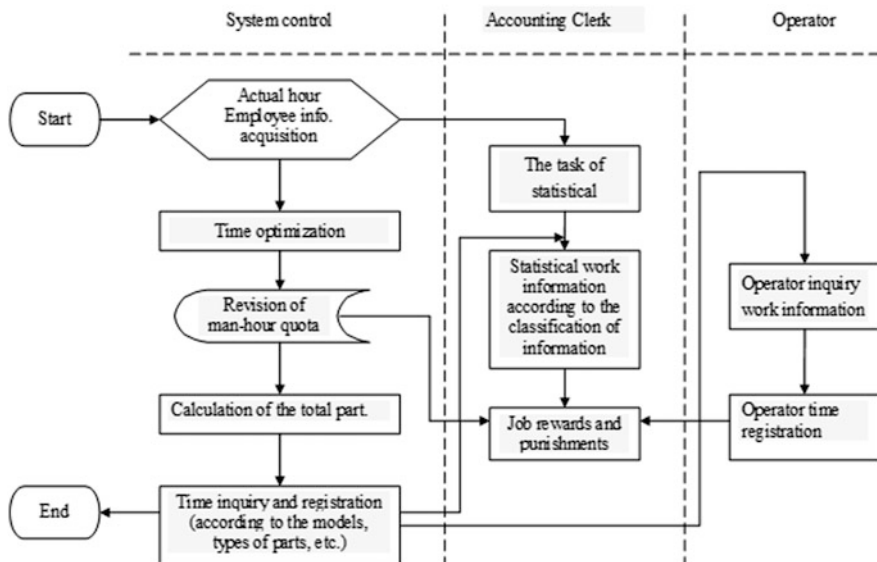


Fig. 2.1 The management of man-hour quota

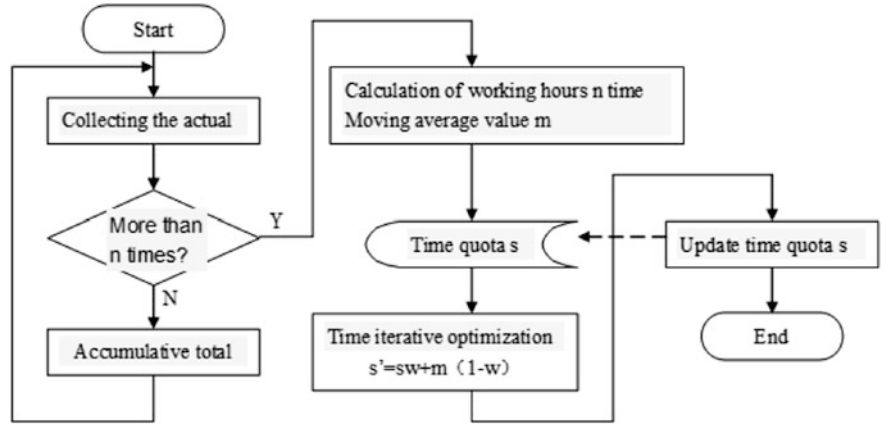


Fig. 2.2 Working revision algorithm with real time optimization

Optimized man-hour quota is written to the standard time as a new norm to be used, and as a norm of working hour in the next optimization, that is:  $s' \rightarrow s$ , till accomplish the optimization iteration process.

In the actual work management process, need to set two optimization parameters dynamically, that are moving average parameter  $n$  and quota standard weight  $w$ . The moving average parameter can be set up short-term, medium-term and long-term, correspond to 10, 30 and 90 times. Weight  $w$  controls routine acquisition of actual working hours on the standard complement of degree of disturbance. In general the disturbance is the actual situation of enterprises, the initial can be relatively larger, in 0.4–0.5, after accumulating of a long time, and the value may be low, at around 0.2. Value of specific can consult enterprise actual condition adjustment [6]. As shown in Fig. 2.2.

### 2.4 The N-Times Moving Average Algorithm Based on a Particular Data Table Structure

Due to time optimization algorithm to ensure the long period, can engage in tracking optimization process data changes, in the offline state maintains the data state, and thus requiring the use of a table of database data aided optimization flow control. Among them, cycle counting, times of collection and moving average are variable. They will change in every optimization cycle. Specific data corresponding relations as shown in Fig. 2.3 in practice, the data table structure and corresponding algorithm can be replaced.

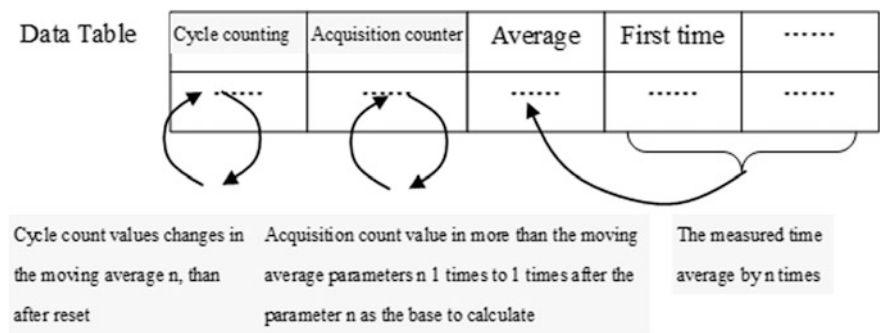


Fig. 2.3 Data corresponding relationship in data sheet in moving average

2.5 Summaries

In the company of quota management involves four parts of norm formulation, implementation, and statistics and revised. No matter what enterprise reference standard, man-hour quota integrated management method should be preferred to software plug-in manner, dynamic fitted to a production management system, thus adding processing quota management function. Man hour quota implementation related to historical data preparation, quota standard formulation, production validation testing, production data acquisition, and so on, which are closely related with production management system. However, the based method mentioned in context combined with the actual production work to revising time quota, can realize the time dynamic tracking reflect the production capacity for change, to accurate and fair.

References

1. Xiu M (2008) The calculation of man-hour and material quota in CAPP. CFHI Technol 2(5):76–77
2. Nitta I, Shibuya T et al (2007) Method and apparatus for estimating man-hours [P].JAPAN: JP 2007211760 8:290–297
3. Wang C, Wang D, IPWH et al (2002) The single machine ready time scheduling problem with fuzzy processing time. Fuzzy Sets Syst 127:117–129
4. Foulds LR, Neumann K (2003) A Network flow model of group technolog. Math Comput Model 38:623–635
5. Tseng HE, Chang CC, Chang SH (2005) Applying case-based reasoning for product configuration in mass customization environments. Expert Syst Appl 29(4):913–925
6. Wu Y (2010) Research and development of intelligent welding CAPP system, vol 12. Nanjing University of Aeronautics and Astronautics, Nanjing, pp 90–97



<http://www.springer.com/978-1-4471-4810-4>

Informatics and Management Science II

Du, W. (Ed.)

2013, XXIV, 810 p., Hardcover

ISBN: 978-1-4471-4810-4