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ESSENTIAL FACTORS OF OPERATIVE LEVEL PRODUCTION CONTROL IN INTEGRATED MEAT PLANTS

PEKKA TURKKI
Finnish Meat Research Institute
P.O. Box 56, FIN-13101 Hämeenlinna, Finland

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Introduction

The meat companies operate as a part of the value based marketing chain reaching from the primary production to the final consumer. Integrated meat plant also forms a chain inside the company: it consists of a slaughterhouse, boning room and meat processing component. These components are strongly dependent on each other linked with the supplier - customer relationship. A production system's control mechanism can be regarded a system, whose elements are the system's goal variables, the system's or its output's controllability factors and the used managerial principles (Eloranta 1981). A goal is a desired final result pertaining to the system's condition or output (value given to the goal variables). A system's ability to reach the goal from its present state is called controllability. A production system or its output controllability, consisting of the controllability factors, can, again, be utilized by certain means for attainment of a goal; these are called managerial principles. The systematic study of goals, controllability factors and managerial principles is called controllability analysis. The method was introduced by Eloranta (1981) and it has proven to be an effective approach for design and development of production management systems in many kinds of industrial plants. There were, however, no applications of the method known in the meat field. The aim of this study was as a part of a large research project (Turkki 1994) to test if the conceptual model of the controllability analysis is suitable for shop floor control in integrated meat plants. The study was also aimed at showing the weight of different subareas of production control in integrated meat plants on the ground of the controllability analysis.

Methods

The priorities in the setting of goals, controllability and the selection of the managerial principles within the meat industry were studied in eight Finnish companies of a cooperative type. The interview was arranged at two levels of organization: (1) at the level of top management and production planning responsible for the control of the production system as a whole and (2) at the level of production managers and work supervisors responsible for a part of the production system.

For the part of the directors and production planners (21) the study was undertaken as personal interviews with the purpose being to find common features from the companies' production control practices. For the production managers and the work supervisors a total of 84 questionnaires were mailed. In order to facilitate comprehension, the questionnaires were prepared separately for the repliers within each subarea by using the terminology of the subareas concerned but trying to keep the contents of the questions unchanged. The understandability of the questions was tested with three trial repliers. The topics dealt with in the interviews were: the control of materials, capacity and delivery.

In the questions concerning the goals and the managerial principles the repliers were asked to rank the alternatives given in an order of precedence. The significance of the differences between the replies was tested statistically by an improved Kramer's method presented by Basker (1988). In the part of the study concerning controllability production managers and work supervisors were asked to evaluate the importance in their own working environment of the presented claims concerning controllability on the five point interval scale. More than one claim could refer to the same controllability factor.

Results and discussion

In the interviews of the top management the dual character required of a production system became emphasized. The condition of a production system and its products must be adjusted to the demand situation and the slaughter animals supply situation with the aid of a control system. It indicates that in the production control under study striving for good materials reception performance and corresponding controllability factors and managerial principles are of great importance.

In the interviews of operative production management good customer service was considered to be a significantly more important goal than any other main goal (Table I). A good customer service was emphasized in all production system subareas unlike a good materials reception capacity, which was emphasized only in the slaughterhouse. High and even capacity use was considered to be more important than small inventories.

Because of the central position of the customer service goal, it is not unimportant by which means an attempt to secure a good customer service is made. The correct managerial principles can be found through correct determination of the delivery time and quality assurance (Fig. 1). In Finland, the retail sector's great negotiating power has forced the meat industry to extremely short delivery times. This also explains why the interviewees in charge of sausage manufacture considered stocks-based management (sale from stock) to be a better principle than customer-based management (make to order). At present, however, there are hardly any companies where the production would be purely stocks-managed, part of the production being based on actual orders. Increasing customer-based management would, however, be highly justified. First, delivery performance would improve, because in customer-directed activity the initiative for production comes from the customer, not a forecast. Second, the customer could be offered a little fresher and longer preserving products. Third, this managerial principle would compel the company to clarify the customers' needs more actively. Proactive quality assurance is believed to be the most important managerial principle in the meat industry leading to a good customer service.

In a meat company's production system the materials flow and the very properties of the materials are influenced through materials management enabling reception of the slaughter animals and keeping of the inventories as small as possible (Fig. 1). There is controllability in the

materials flow only in the case where the meat producers agree to postpone or speed up the slaugtering of their animals. In practice, this means a play margin of not more than a few weeks. If production contracts are relied on, raw material can at long range be aquired more in conformity with the consumption forecasts than under management based on an open delivery relationship. In addition, contract production could increase the useful interaction between the meat producer and the slaughterhouse, if supplementations concerning the quality of meat production were also included in the contracts. At short range, the arrangement of cattle transportations is an efficient managerial principle, for which more efficient auxiliary tools would be needed. Materials use can be directed efficiently at the end of the production chain by utilizing the interchangeability of the meat trimmings in the formulas of the end products.

The alternatives in capacity management are either the adjustment of capacity to the variation in the demand for products and the supply of animals or the elimination of the need for adjustment (Fig.1). The goals concerning capacity use can be influenced by these managerial principles through the controllability of labour and the process factors. In the meat industry, the adjusting principles are clearly considered to be more important than the reducing of the need for adjustment e.g. by permanent undersizing of capacity. The most important means of management adjusting capacity in the meat industry belong within the scope of labour controllability. Such means are the arrangement of vacations and days off and temporary transfers of labour from one job to another. Increasing the work motivation by letting the workers participate in the planning of work is another efficient means of influence. Proactive quality assurance, to which belongs the worker's training and motivation to carry out the work correctly initially, is a managerial principle leading to even capacity use. The Japanese managerial principles, such as JIT and Kanban, presuppose a strongly customer oriented pull principle, which would be difficult to realize in meat companies in their entire production systems. Pull principle is perhaps possible at the beginning of the production system until the carcass storage, because thanks to the newest technology the carcasses can be classified by primal cuts and thus the suitability of each carcass for boning into certain products is known. Following the Kanban principle fully in the post-slaughtering operations is also difficult, because in the boning room products other than the ordered ones are produced besides the main product.

Conclusions

A dual nature of control was emphasized i.e. the coordination of independent slaughter animal supply and demand for products. Good customer service has to be stressed by shifting more to the principle of customer-based production (make to order and proactive quality management principles). The controllability of materials flow require backward integration along the chain to the animal producers. This necessitates to develop and link up the quality systems of meat producing farms and the quality system of integrated plant together on the contractual basis. The Japanese managerial principles, such as JIT and Kanban would be difficult to realize in meat companies in their entire production systems.

References

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Table I. Priority of production control goals expressed in rank sums. Rank sums in the same column with the same superscript letter indicates no significant difference among the rank sums at the statistical significance level $p < 0.05$.

Goal	Production system component			
	Slaughter-ing (n=16)	Boning (n=21)	Sausage manufacturing (n=18)	All (n=55)
Good customer service	21[a]	29[a]	30[a]	80[a]
Good materials reception capacity	34[ab]	65[b]	58[c]	157[b]
High and even capacity utilization	34[ab]	52[b]	37[ab]	123[b]
Small inventories	47[b]	52[b]	51[bc]	150[b]

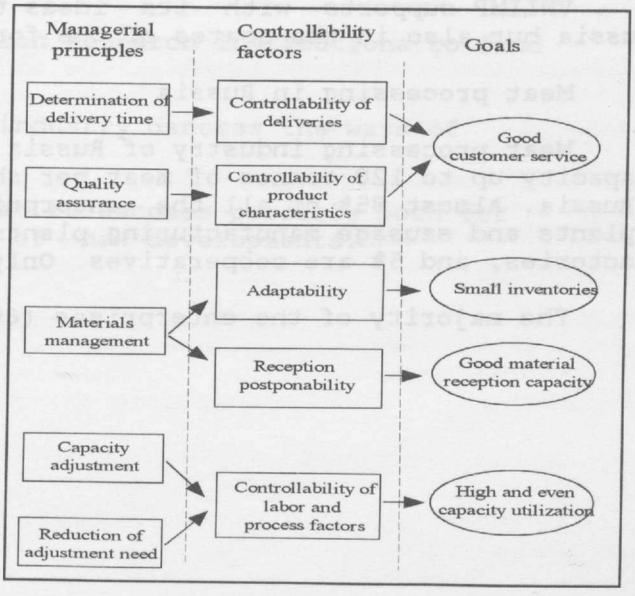

Figure 1. Key factors of production control.