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Global ergonomics strategy in Volkswagen: from the product construction, over the planning until the serial process

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Abstract. The Volkswagen Group operates and coordinates the activities of ergonomics from Wolfsburg in Germany and works with its contact persons of every plant and brand of the group towards an integrated proceeding relating to ergonomics.
For the ergonomic process it is very important to consider the ergonomics in the whole production process, still from the beginning the conception and construction of the vehicle in the early phases. In these phases there is a big potential to work in the preventive ergonomics and avoid correcting the workstations after start of production. Therefore, it is important to have fluently information in all this phases and identify the potential in each of them. In order to attend these items, Volkswagen has defined different activity fields: coordination of ergonomic standards and the roll-out into all the plants, introducing the ergonomic items in the product development process (PEP), considering the constant improvement of the workplaces in the Volkswagen-Way (KVP and 3P Workshops), taking care of an adequate qualification concept in ergonomics and the intern and extern information exchange within the committees.
This topic is established in the industrial engineering of the production area of the group. We are working interdisciplinary with the medical services, human resources, work council and the protection of labor.

Keywords: product creation process, ergonomic standards, interdisciplinary ergonomics

1. Introduction

The basic question deals with what ergonomics is about: on the one hand there is the workplace with the focus on workplace design and work organization and on the other hand the employees have to be considered regarding to correct postures and motions (as an essential demand on qualifications) and beneficial motions with view to self-discipline [3].

There are different needs for action in terms of ergonomics. First of all, the human factor described of health hazards and social influences cross one´s mind. But also legal aspects occupational health and safety act, EC directives, requirements from professional associations and the social codes are ones of the first ideas of ergonomics. Another mean occurs of the economic factors which deals with issues like optimization of production times, quality improvement, and deployment options for employees in the value-creation process and also wage agreements. As well normative parameters have to be considered which are detailed of agreed collective wages (e.g. ERA) and frameworks (e.g. Volkswagen Way). Finally, the often discussed demographic development, the developing age structure of the workers and culture changes build the social-culture factors [3].

Thus, there are a lot of components which deals with ergonomics contents and include a huge amount of activities in the occupational science. In this article the role of ergonomics in the Volkswagen Group and concerned fields of activity will be explained [3].

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2. Ergonomics as an element within the production system

For increasing quality and productivity, cost-saving, improving production deadlines or reducing processing time a value oriented and synchronized production system delivers the necessary methods and instruments [2].

This characterized standard is called production system house. The basics of the house built a stable basement with the pillars of tact, flow, pull and perfection. For an efficient survey of potentials all principles should be considered equally. Each element of the production system is composed of method components like shown above [2].

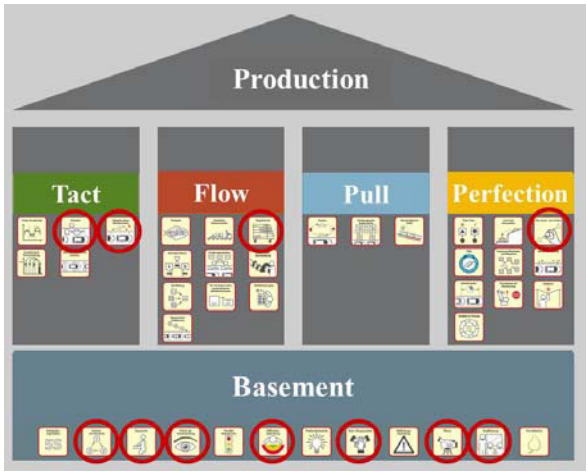

Fig. 1
Production system house of Volkswagen Group [3]

The red framed method components (MC) are allocated to the basics and principles of the production system. Ergonomic workplaces are part of the basic principles of a production system and are supported by the method components pertaining to work organization, standardization, avoidance of waste and work cycles [3].
Some examples of method components of the productions system and ergonomics are [3]:

- Ergonomics: Evaluation of workplaces according to Group standard European Assembly Worksheet (EAWS). Ergonomic analysis is determined by the Industrial engineering (IE) of the plants and often used in the continuous improvement process (CIP). This method component provides good points of approach from identified ergonomic deficits towards an optimized design and includes information concerning specific physical stress factors.
- Grip range optimization: The term “grip range optimization” describes the ergonomic provision, location material and tools for the work process within optimal grip range in order to avoid unnecessary motion ensure ergonomic work flows and support two-handed work and “blind griping”.
- Teamwork: Is a mean of multiple qualifications of employees. Exemplarily the possibility of a targeted rotation in case of physical stressful workplaces and the case-specific support by team spokesperson, thereby maintaining the specified cycle time.

Other concerns with ergonomics are linked with productivity in form of smaller reach ranges in reducing the production times and improving ergonomics in details. So, there is not a general conflict of targets between improvement of ergonomics and optimization of production times. Considering the team organization could be realized an improvement of ergonomics by targeted rotation (Figure 2) [3].

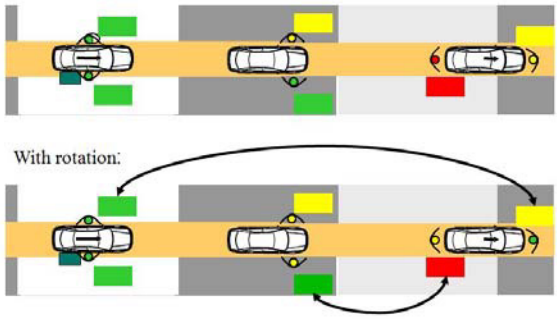

Fig. 2
Team organization - Improvement of ergonomics by targeted rotation [3]

Obviously, team organization seems to be an acceptable solution to handle critical workplaces. The enclosed paragraph gives an overview about the possibilities of acting with ergonomics in the Volkswagen Group.

3. Fields of activity

For having a responsible ergonomic approach aims like the arrangement of ergonomic workplaces or processes, maintenance of healthy and sustained utilisability of all workers, avoidance of physical stress

etc. do not suffice. In the following figure the fields of activity concerning ergonomics in the Volkswagen Group are displayed [3].

Fig. 3
Fields of activity in terms of ergonomics [3]

One topic is to establish ergonomics standards and coordinate the roll-out in every plant of the group. Another is to standardize processes, e.g. to integrate the ergonomics in the production creation process (PCP) with inclusion of Medical Services. A further input is the regard of ergonomics in the CIP of the Volkswagen Way. A very important development is the qualification concept which consists of basic, theoretical and practical trainings and which is going to be rolled out in the whole group. For a regular exchange between all plants and brands of the group was settle up a group of ergonomics experts who meet three times a year to discuss actual developments and problems. Also, an interdisciplinary group with members of works council, medical services, and human resources and so on was founded to push and support the ergonomics issues.

The enclosed sub-paragraphs give a detailed overview about each activity field.

3.1. Drafting ergonomics standards and roll-out plants

First of all, a procedure had to be established to identify workplaces with ergonomics requirements and which still need to be resigned. Further, should be clarified what has to be redesigned and how much has to be invested relating improving these workplaces. Another issue is the replacement of employees with reduced performance. The task is a determination of status of all workplaces for defining the need of action.

For a determination of status the use of objective evaluation parameters is necessary. Such requirements are for example reliable and clear collection and registration of data, broad-based approach of analysis, preventive orientation, clarity etc.

The group-wide evaluation method is the EAWS which "[…] is a mean of analyzing and evaluation risks of physical stress and is applicable in the planning and in the production phase. The method considers the four workload types "postures", "forces", "manual materials handling" and "repetitive loads of the upper limbs." [1] The resulting ergonomics points of the work-scientific evaluation methods are interpreted according to the following traffic light system (Figure 4).

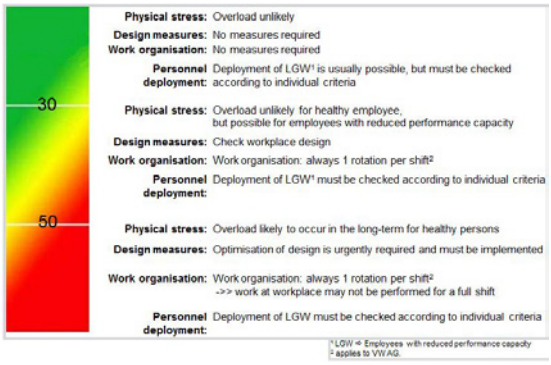

Fig. 4
Field of activity "Ergonomics standards - Group-wide evaluation method: PHS-Nr. 915" [3]

Another example is the ergonomic stacking in press shop with 12 standards. The aim is the optimization of ergonomics and the deployment of employees with regard to increase the productivity with improvement of ergonomics [3].

On the hand it is useful to generate standards, but without integration into a standardized process, e.g. PCP, it is not possible to consider ergonomics from the beginning of the earlier phases like figured in the following sub-paragraph.

3.2. Standardized processes (PCP)

The integration of ergonomics starts in the concept phase with the focus on influence on product which implies the implementation of ergonomics requirements in product development. One example is the ergonomics measure at the rear lid trim cover of a design model. The rear lid trim cover was optimized for assembly with low joining forces in one direction. The 3-piece window frame trim cover with reward to

simple positioning in accord of directions of joining equals direction of attachment. Another example is the bumper cross beam. In the predecessor model the bumper cross beam had to be hold the whole processing time. After construction of a holding tab this was not necessary anymore [3].

After the concept phase follow the planning phase and the series process with the focus on influence on process planning. Exemplarily, are changes of cycle sequences with reducing the work height (e.g. installation of wiper arms and cover) and the use of ergonomic aids like the assembly seat sliding (e.g. installation of airbag control units, rear-seat release) [3].

These measurements are aligned in the Volkswagen Way, especially in the CIP and 3P workshops. Detailed information follows in the next subparagraph.

3.3. Volkswagen Way (CIP and 3P workshops)

With view on the framework of the Volkswagen Way the group interchanges measures concerning "non-ergonomic work processes" in Maßnahmen@web which is a system solution of Volkswagen. There are filed solutions from different plants and brands for exchange relating to ergonomic workplace design. These best practice examples help to get information about the implementation process and to get in touch with the developers. One example is the rear seat (Figure 5) which had to be installed manual and with the use of a manipulator it is not necessary to lift such a high weight.

Fig. 5
Example of Best Practice – Assembly: Rear seat [3]

One demand is that all plants and brands actualize the database for new measurements and details. The transfer of the best practice knowledge and the won information of the workshops are important to integrate the ergonomics in the PCP and the whole company issues.

3.4. Ergonomics qualification

The ergonomics qualification concept is divided in employee qualification for ergonomic workplace design and otherwise employee qualification for ergonomic work execution. The first part examines the relationship prevention with look at ergonomics-compliant product development and planning of ergonomic workplaces and their evaluation. The other part deals with the behavior prevention of the employee and if the employee acts with his qualified knowledge (Figure 6). With view on the relationship prevention there are two forms of qualifications: on one side with the targets of the workplace evaluation and on the other side the awareness and understanding of ergonomics on the basis of practice examples. The first point contains the basics with objectives, possibilities, legal regulations etc. and afterwards the method EAWS with analyzing typical workplaces from different areas of production. Last point of this practice training makes the analysis with the IT solution of the Volkswagen Group which means AP-Ergo. A very important fact is that all qualification courses should be participated in the explained order [3].

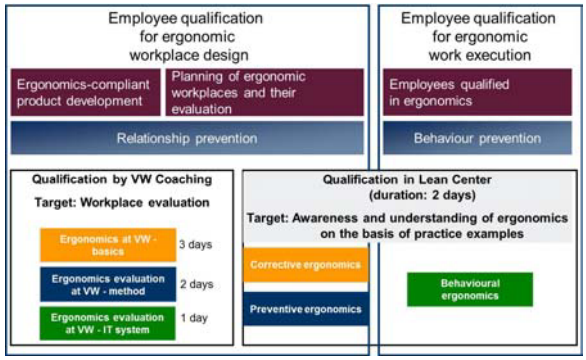

Fig. 6
Qualification concept of the Volkswagen Group [3]

At the moment the group is working towards a group-wide integration and roll-out of the qualifications to guarantee the same standards in every plant and brand of the group. This issue is one point which is discussed in the international exchange committee which will be pictured in the following subparagraph.

3.5. Exchange committees

The group has built up an intern group with contact persons of Industrial Engineering, Medical Services, Human Resources, work safety and works

council. This group discusses standards, changes and other developments concerning methods and proceedings in respect of ergonomic workplace design.

Like mentioned before, exits an international group of ergonomics experts of nearly every plant and brand of the Volkswagen Group which get together about 3 times a year to describe problems, developments and progresses.

4. Discussion

This paper has shown that ergonomics play a major role in the Volkswagen Group and there exists a well thought-out process considering ergonomics in the PCP, CIP and 3P-Workshops. Furthermore, the fields of activities cover a wide range of issues with ergonomics contents and needs for action in terms of ergonomics. To sum up, the human being is centered in the Volkswagen Group.

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