Technical note

Corporate ergonomics programme at BCM Airdrie

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Abstract

The production processes at the BCM Airdrie site range from manual loading tasks in the manufacturing areas to high frequency packaging assembly tasks on the production lines. Both are jobs that are known to carry risk to musculoskeletal health, so an ergonomist was appointed to design and co-ordinate an ergonomics programme for the site to control these risks. This paper details the programme that has evolved to proactively manage musculoskeletal risks in the design of both new and existing equipment and processes. The ergonomics procedures described primarily involve the engineers from all areas of the factory, and the process for ergonomics involvement with engineering design projects is described. Shop-floor personnel involvement is considered to be an essential part of the programme and ‘Ergonomics Champions’ are being trained on the packing lines to monitor the risks that are sometimes introduced with the different designs of product packaging.

Keywords: Manufacturing industry; Musculoskeletal disorders; Prevention

1. Background

Boots Contract Manufacturing (BCM) is the largest contract manufacturing company of its field in Europe, developing and producing a wide range of cosmetics, toiletries and healthcare products. BCM has eight factories and one major development laboratory. These are located on the company’s main site in Nottingham (England) and in Airdrie (Scotland), Vitré and Flers (France), Dietzenbach (Germany) and Tarragona (Spain).

This paper focuses on the ergonomics activities at the BCM Airdrie site in Scotland where cosmetics, suncare, bath/shower and baby products are produced for Boots the Chemists and other third party retailers in the United Kingdom, Europe and overseas. The site currently employs 900 permanent members of staff with 380 packing operatives and 85 product manufacturers. The scope for applying ergonomics in the Airdrie factory is vast when you consider that on average, the company develops more than 1000 new products and produces more than 120 000 000 single items every year.

Many of the processes in the Airdrie factory, ranging from manual loading of liquids and powders into manufacturing vessels to high frequency manual assembly tasks on a production line, have classically been linked to workplace musculoskeletal health problems. It is therefore important to mention that the ergonomics activities in the factory were not instigated as a result of any litigation claims against BCM Airdrie. With the general increase of public awareness about these issues, the company is instead committed to proactively tackling any musculoskeletal health risks.

Following the secondment of a student ergonomist from Loughborough University in 1995, and the involvement of an ergonomics consultancy in 1996, BCM Airdrie appointed a full-time Ergonomist in June 1997. The following paragraphs summarise the structure of the ergonomics programme that has since developed.

2. Role of the Ergonomist

The role of the Ergonomist at BCM Airdrie is to design, coordinate and facilitate an ergonomics programme which deals proactively with ergonomics issues in the design of workplace equipment and processes (see Fig. 1 for a summary of the Ergonomists roles and responsibilities with the programme). A strategy has been designed by the Ergonomist to drive ergonomics in a structured manner throughout the factory by implementing five core initiatives (as described in Section 3).
To tackle ergonomics issues effectively, these initiatives require support from a number of different job functions and departments, so a detailed ergonomics policy document has been included in the BCM Safety and Environment policy manual to describe each individual’s roles and responsibilities with the programme. The implementation of this programme required new documentation to be developed to support the proposed initiatives (see Sections 3.1, 3.2 and 3.4), and training courses for other job functions involved to increase awareness of the procedures being implemented. This was all designed in-house by the Ergonomist to be specific to each of the roles being addressed.

3. Ergonomics programme structure

The ergonomics programme at BCM Airdrie aims to prevent work-related musculoskeletal disorders via five-core initiatives (see Fig. 2). The key departments and job functions involved are the Ergonomist, Project Engineering and Shop-floor Personnel, and a summary of the procedural links and responsibilities will be described in greater detail for each initiative.

3.1. Ergonomic risk assessment

A standard checklist format has been designed to record ergonomics risk assessments in the factory. These assessments are reviewed by the Ergonomist every 2 years, and updated as required if there have been any changes made to the task or equipment. The checklist is split into four modular sections (general posture, manual handling, VDU and hand tool) and an initial task analysis of the job will determine which sections should be completed. The checklists are presented in a tabular format, where the columns to record the level of risk are banded into three zones which are colour coded to indicate the level of risk for each factor (i.e., green [low risk], yellow [medium risk], red [high risk]). The level of risk is estimated according to the number of times that each risk factor is observed during the task cycle (i.e., the greater the number of times that the factor is observed in the task cycle, the higher the risk). At the end of each checklist, an overall estimate for the level of risk can be calculated in the form of a percentage for each task or individual checklist section. If more than one section of the checklist has been completed, the percentage result for each section is weighted according to the proportion of time spent on each section during the task cycle and combined to give an overall level of risk for that job.

Projects for improving the ergonomics of existing work equipment and processes are selected and prioritised based on these risk assessments. The factors within the checklist that have been given a ‘high’ or ‘medium’ risk rating indicate the areas where ergonomic intervention is required. Recommendations for improvement are presented to the department in the form of a report and a timescale for completion is agreed with the

Fig. 1. The role of the ergonomist at BCM Airdrie.
Once the improvements have been implemented, the same checklists are completed again to give a direct comparison of how successful the ergonomics intervention has been with reducing the risks that had originally been identified.

### 3.2. Ergonomics ‘change control’ assessments

The packaging for each of the products manufactured on the site are delivered as individual components (i.e. bottles, caps, etc.) and are assembled in stages as the product is conveyed down a packing line. The packaging for every product range is unique and with such a diverse range of product features, it is impossible for the factory to have one packing line dedicated to a single product type. Standard pieces of assembly equipment are instead built into each packing line and compatible machine ‘change-parts’ are ordered to suit each product once the packaging design has been finalised. The engineers in the department normally install these ‘change-parts’ as part of a standard product changeover procedure. However, due to the vast number of new products manufactured on the site, there is occasionally a delay with the supply of the change-parts and tasks that would normally be performed automatically must be carried out manually to allow the work order to be completed. These manual assembly operations can potentially increase the risk of developing ULD symptoms, so the structured involvement of personnel from the production area is essential to ensure that any such risks are detected at the earliest stage possible. This increases the opportunity to provide early and effective intervention, which greatly reduces the risk of exposure to potential musculoskeletal risks.

A representative from each team on the packing lines is therefore being trained by the Ergonomist to act as ‘Ergonomics Champion’. Each Ergonomics Champion is involved in a 12-week project to develop their understanding of workplace ergonomics and risk assessment, focusing primarily on issues relating to packing design and product assembly processes. The risk assessment methods used by the Ergonomics Champions are developed specifically for detecting these factors in the form of a ‘change control’ checklist which is completed for every new product. The checklist has been designed to highlight any ergonomic risks with the manual assembly tasks at an early stage of production before anyone has been exposed to the risk for a significant period of time. Issues such as repeated application of force, extreme upper limb posture, insufficient muscular recovery and any possible risk factors related to the packaging design features (e.g. sharp edges or ridges on the product which may dig into the fingers) are included. The checklists provide a comprehensive and auditable ergonomics risk assessment record of all activities on every packing line in the factory, and feedback of the issues detected via the risk assessments is presented to the product developers so that similar problems can be avoided in the future.

### 3.3. Ergonomics problem-solving workshops

A workshop-based process has been implemented for developing solutions to ergonomics issues relating to existing equipment and workstation design. The ergonomist discusses risk assessment results with the Department Managers to identify and prioritise potential projects in their area. A manager from the department involved is then asked to act as ‘sponsor’ to the project. This demonstrates that the department is committed to finding a solution to the problem and that support will be given to ensure that the solution is implemented within the given timescale.
The Ergonomics Champions from the packing lines or departments affected and representatives from any other departments (depending on the issue being addressed) are asked to be part of the project team (consisting of approximately six to nine people). Technicians and Engineers are also asked to join the project teams, and workshops are held with each group for a predetermined timescale to develop a suitable solution. The Ergonomics Champions provide a valuable link when communicating progress to the Teams and for arranging involvement from other Team Members when required (e.g. user trials).

3.4. Ergonomics input into engineering design

A procedure has been implemented to ensure that we minimise the potential for musculoskeletal problems by ergonomically optimising the factory processes at the design stage of any new equipment installation. This procedure primarily involves the Project and Departmental Engineers, and a series of 1-day training workshops designed specifically for this factory were presented to formalise the procedures used to document ergonomics involvement with the engineering design process. As well as providing a general awareness of ergonomics issues in the workplace, this workshop stressed the importance of addressing ergonomic factors as part of the engineering design process by presenting data which demonstrated that the cost of rectifying ergonomic issues after the equipment has been installed is much greater than the cost of integrating ergonomics factors into the project at the design stage.

For each new project or installation, the Ergonomist is therefore incorporated into the project team and supports the project throughout the design process. If possible, an ergonomics risk assessment (as described in Section 3.1) is completed on a similar workstation or item of machinery to the one being installed (either on-site or during a visit to the product manufacturers) to determine any foreseeable risks at an early stage of the design process. Regular meetings are held with the project team managing each project throughout the design cycle and advice is provided as required on how any foreseeable risks can be overcome as the engineering design evolves. If the design of the new equipment can be based on existing equipment in the factory, or if a ‘mock-up’ can be made of the equipment layout and working heights, user trials and Team meetings are organised by the Ergonomist for the Teams who will be using the equipment to have an input into the design. Visits to the equipment manufacturers are also organised by the Engineers for some of the operators to see the equipment before it is purchased to assess its suitability.

Once the equipment is installed, an ergonomics ‘sign-off’ is requested by the project team. Information is provided at this stage by the Ergonomist in the form of a risk assessment (as described in Section 3.1) and this is supported with a summary checklist that has been designed specifically to provide feedback to the engineer on the ergonomic suitability of new equipment installations. This document states whether issues relating to working posture, task design, manual handling and individual physical capability (including ergonomics issues relating to equipment maintenance and change-over) have been suitably addressed. Any outstanding risks that have not been addressed are recorded, and suggestions are made for any further intervention required to overcome the issues that have been overlooked in the design.

3.5. Training and awareness of ergonomic work techniques

Whilst the RULA (McAtamney and Corlett, 1993) assessments were being completed on the production lines, a huge variation in individual working methods and techniques were observed and this has identified a need for more detailed ergonomics instruction for all current employees and anyone new to the company. A training package is currently being developed for each Team to provide training and advice specific to each Team’s processes. This material is currently being presented to existing employees in a 2 h training session to ensure that they are aware of this information. Each employee retains a booklet for future reference, and a certificate of attendance is issued so that we can demonstrate that everyone has been made aware of how to use the most comfortable and appropriate working techniques.

4. Supporting initiatives

There are two other initiatives on the site that are not a core initiative of the ergonomics programme, but are supported by the Ergonomist due to their relevance with the control of musculoskeletal factors in the workplace.

4.1. Workplace health surveillance questionnaire survey

A plant-wide musculoskeletal health surveillance questionnaire survey was recently completed by the Occupational Health Doctor for the Airdrie site. The results of this survey were statistically analysed in conjunction with a set of RULA (McAtamney and Corlett, 1993) assessments that were completed for every packing hall workstation to detect any ‘clusters’ of reported symptoms which could possibly be attributed to the workplace design. The areas where these ‘clusters’ were observed have been prioritised in the ergonomics problem-solving workshop plan (see Section 3.3).
This was an extremely valuable exercise for the site and we plan to reassess the workforce using a similar questionnaire in approximately 2 years time to measure the benefits of ergonomics intervention in the factory and to prioritise areas where further work is still required.

4.2. Upper limb disorder procedure

In 1997, BCM issued a group policy regarding the management of upper limb disorder (ULD). This policy includes a detailed procedure to manage ULD for anyone who develops any symptoms and standard documentation is provided to support the procedure. This documentation ensures effective communication between Occupational Health (who assess the individual reporting symptoms) and the managers of the employee affected, and also records any action that has been taken following the assessment. The procedure relies on early reporting of symptoms and efficient treatment, so all factory employees are now briefed as part of their company induction on the types of symptoms that may be experienced, and how to report them.

The Personnel/Occupational Health departments on the site have been responsible for implementing the ULD procedure and the Ergonomist provides support as required. Since it was implemented at BCM Airdrie in August 1997, this procedure has been extremely effective in enabling both early identification and rapid rehabilitation of employees presenting with upper limb symptoms.

5. Communication

The scope of the ergonomics programme that has been described involves and affects almost every job function on site, so employee awareness and an effective communication structure is essential. The Factory Managers attend an Ergonomics Steering Committee meeting once every 2 months to provide support for ergonomics improvement projects and to authorise funding from the capital budget to implement some of the improvements. The Factory Managers also communicate any developments with the programme to the Company Executive based at the Group Headquarters at Beeston in Nottingham on a regular basis. A monthly project summary is published to update the Steering Committee and other managers on the current status of the ergonomics activities in all areas of the factory. However, to ensure that everyone is aware of work ongoing in other areas as well as their own, this project summary will soon be published in a newsletter format and circulated into all departments to further increase the profile and awareness of ergonomics activities.

6. Conclusion

The final stages of the programme that has just been described are still being implemented, so it is difficult to quantify at this stage exactly how successful the programme has been. However, the Occupational Health Service has documented a gradual reduction in the number of employees referred with upper limb symptoms and also report that employees with symptoms are being referred by management at an earlier stage. This alone is an encouraging indicator that the programme has so far been successful and is fulfilling its aim.

As a company, BCM firmly believe that their reputation for producing high-quality products depends on both the quality of the workforce and the quality of the working environment. We take both aspects seriously and are confident that using ergonomics to help develop a well trained, motivated and well informed workforce will contribute to the company’s overall business goals.

Reference