Evaluation of the reduction of respiratory protective equipment (RPE) fit factors in personnel with facial hair

Neil Grace, 2010

ABSTRACT

In order for respiratory protective equipment (RPE) to be effective it should have an adequate seal. An important part of any RPE programme is face fit testing to ensure this seal is effective. It is thought that facial hair such as beards, or even being unshaven, can significantly reduce the seal and the protection afforded by the RPE. The author had some personal experience of this when carrying out fit testing of RPE and decided to pursue this further.

The aim of this research is to assess the reduction in protection of RPE during a period where the user is growing facial hair; to use the results of the study to educate RPE users and promote best practice and allowing the results from this study to bring up-to-date any health and safety practices that fall short of the standard required to protect a work-force that use RPE.

Fit testing was carried out on volunteers from the oil and gas industry with measurement of fit factors together with ambient particulate levels. There were 6 tests in total for each of the twelve volunteers: day 1 (clean shaven), day 3, day 5, day 8 and day 12, plus an extra clean shaven test on day 13 (this would be a control test to support day 1). The schedule was mapped out allowing the data to be collected on the growth and texture of facial hair and of course the reliability of RPE. A literature search for relevant previous research was also carried out.

The ambient average of particulate in the testing location remained at a very steady level throughout the study, ensuring consistent results. Statistical analysis suggested that the measurements were reliable.

There was a high variation of test results for all clean shaven volunteers who undertook the face fit study. The clean shaven re-test on day 13 showed consistent results with their initial day 1 clean shaven test, showing no statistical significant difference.

Two days of facial hair growth (day 3) were sufficient to jeopardise the face mask’s efficacy. There was deterioration towards day 12 but it was not possible to identify the point of deterioration.
The results for day 12 showed a significant reduction in fit factors for at least 50% of the volunteers and 75% of volunteers showed a reduction of fit factor on the final unshaven test compared with their original test. Although, when analysing the data, only 17% of the fit tests failed the HSE protocol, this included all the unshaven tests. Therefore, this figure could be interpreted as inappropriate for quantitative fit testing using the Portacount method.

In conclusion, two days of facial hair growth is sufficient to significantly reduce the effectiveness of RPE. This shows that, whilst it is possible for bearded users to achieve a numerically acceptable fit test, the performance of the mask will be significantly reduced; hence facial hair degrades the performance of RPE.

The findings of this study reinforce the need for face fit testing of RPE and for users to be counselled about facial hair and its impact on the effectiveness of RPE.