Optimisation of Equipment Design for Handling and Maintenance in Radiation Areas
Development of Guidelines

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Introduction

Why guidelines are needed

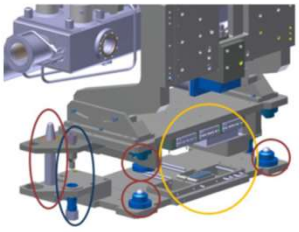
- Design for handling and maintenance is often left late in the design process of accelerator equipment and integration design of new facilities
- This can lead to problems during assembly, transport and installation (costs, time, risks of accidents / damage)
- During operation it can lead to problems of maintenance and repair (accelerator downtime, personnel radiation doses, costs)

Equipment that can benefit

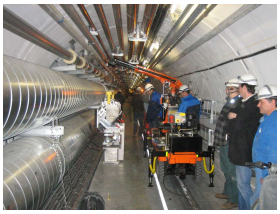
- "Highly radioactive" equipment such as Beam dumps, Collimators, Targets, Vacuum equipment, Magnets such as Inner triplets, TAS, TAN-like items, including their supports, alignment and handling equipment
- "Non-radioactive" equipment such as Arc Magnets, cryogenic equipment can also benefit from the methodology

Application to Projects

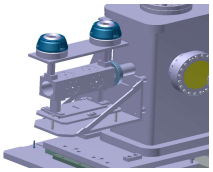
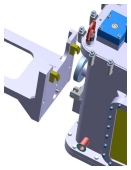
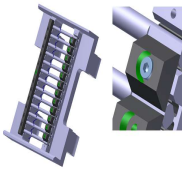
LHC Collimators:
Guidance, alignment and handling features plus plug-in coolant and electrical to allow remote removal and replacement once radioactive. These allowed very fast initial installation, a remotely operated crane has been produced



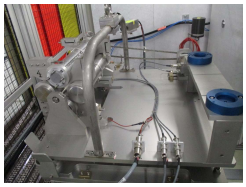


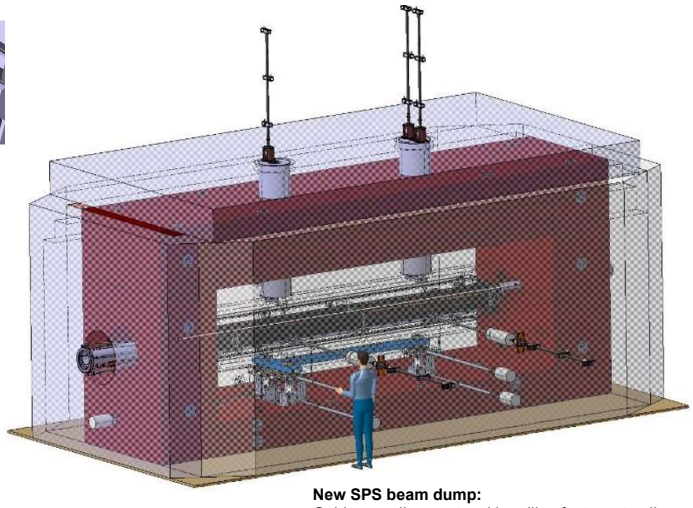



HiRadMat radiation test experiment:
BPM -Replacement of small hidden screws by hook attachment.
Target supports - replacement of 24 small (M4) screws by 4 larger ones

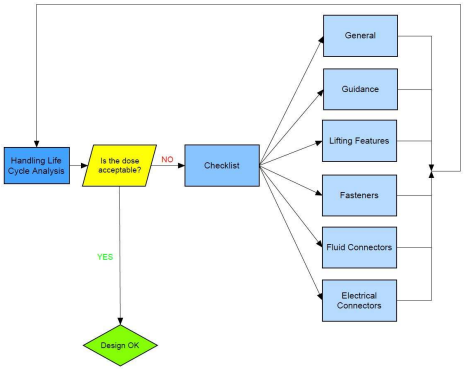
CHARM target table:
Guidance, alignment and handling features to allow remote removal and replacement



New SPS beam dump:
Guidance, alignment and handling features to allow remote removal and replacement of dump and also support jacks. Remote alignment capability

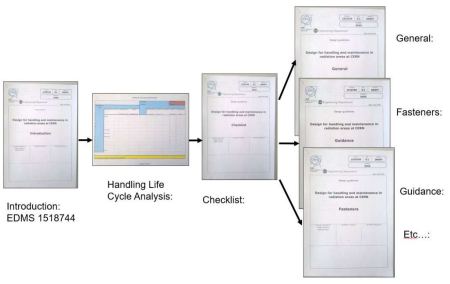
Guideline approach



Approach – guidelines for designers and engineers

Guideline methodology based on "handling lifecycle analysis" which considers all handling operations during the life of the equipment and assesses handling times, personnel radiation doses at conceptual design stage to determine suitable handling methods – including remote handling if needed

Build up set of guidelines collecting best practice from CERN and elsewhere and apply them by participation in short-term and long-term design projects in order to refine the guidelines and provide reference case study examples
Modular structure to allow individual subject modules (e.g. installation guidance, lift points, fasteners, design checklists etc) to be developed based on lessons learned and addition of case studies



Conclusions

A simple structure for the methodology and for the documentation has been developed. The structure is modular and EDMS based to allow ease of development. The principles have been applied to several projects and are currently being applied to ongoing design projects to reduce personnel radiation exposure. The guidelines will be developed based on experience gained in past and future design projects

Sources, Targets and Interactions Group
Engineering Department