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Rapporteur's Report Manufacturing Sector

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1. Introduction

The Manufacturing Sector includes establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. The sector comprised an estimated 14 million paid workers in 2005. These workers face risks that include machinery, repetitive motion, over-exertion, chemicals, and shift work. Representatives from industry, industry associations, labor unions, insurance companies, government organizations, academia, and consulting firms formed the workgroup that discussed opportunities and developed recommendations for widespread deployment of Prevention through Design (PtD) within the manufacturing sector.

2. Most Compelling Idea/Recommendation to Come Out of the Discussions

- The scope of PtD should include new facilities, processes, equipment, tasks, as well as retrofits.
- Successful PtD will require a shift in emphasis up the hierarchy of controls, beginning at elimination and substitution, followed by engineering controls, work practices, and Personal Protective Equipment (PPE).
- Occupational safety and health professionals should recognize business cost drivers, and justify PtD expenditures in terms of Return of Investment (ROI).
- All involved organizations, including government and non-government organizations, academia, professional organizations, industry and industry associations, should work together to create a culture change that infuses PtD into the business process.
- PtD approaches for small business will be different than for large manufacturing companies.

3. Practice (Needs, Challenges, Opportunities)

3.1. Specific Goals and/or Important Areas of Focus

3.1.1. Design Applications

The scope of PtD should include facility, process, tasks, maintenance, workflow, re-design/retrofit, as well as “abnormal tasks” associated with manufacturing operations.

3.1.2. Business Value

Demonstrating the business value of safety and health investments is an essential component of successful PtD. The workgroup recognizes that PtD can prevent injuries and illness AND save money. Therefore, the concept of health and safety ROI is an important driver that should cross all sectors. Tools should be developed and made available for the calculation of the ROI for PtD options, thus ensuring a business case for PtD.

3.1.3. Implementation of Design Strategies/Tools and Resources

Defining the scope of PtD is an important first step in developing tools and resources for implementation of PtD design strategies. The PtD approach should be multi-disciplinary, including health and safety professionals, design engineers, and college curricula for engineering and business administration. Successful PtD implementation will require multi-tiered deliverables, including white papers and standards, as well as specific tools, such as assessment questions, and surveys to evaluate processes or machines. Manufacturers must raise expectations among suppliers for safe equipment.

3.1.4. Good Practice Identification/Sharing and Case Studies

A clearing house should be established for identifying and sharing “best” practices by collecting and reviewing “good” practices. Compiling case studies to create a compendium of

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successful PtD efforts will be important in demonstrating how PtD can be achieved.

3.1.5. Small Businesses

Simplified policies are required for small businesses using a 3-dimensional matrix that considers the size and capabilities of different organizations. “Cook-book” and “tell a story” approaches for small businesses, including “lessons learned,” may be useful.

3.2. Challenges

Four main barriers were identified: (1) the misconception that PtD slows manufacturing processes and increases cost; (2) providing engineers access to identified best practices and encouraging their use; (3) limited resources to reach out to all businesses to implement PtD; and (4) the lack of PtD curriculum in current engineering training.

3.3. Immediate Action Opportunities

The development of a PtD “white paper;” the publication of the ROI concept, including several successful ROI analyses, and the publication of successful industry PtD programs, should be of high priority. Communication about PtD should take priority and can include: PtD as an agenda item at national professional society meetings, PtD communication with consensus standard committees, such as the American National Standard Institute (ANSI) and the American Society for Testing and Materials, and the development of communication channels to various manufacturing businesses, such as local chambers of commerce and industry groups.

4. Policy (Needs, Challenges, Opportunities)

4.1. Specific Goals and/or Important Areas of Focus

4.1.1. Leadership

Three topics pertaining to the leadership aspects of PtD policy development were identified: create a network of CEOs to share their PtD experiences, encourage visible leadership by manufacturing executives in endorsing that PtD is “the right thing to do” and is cost effective, and drive the inclusion of occupational safety and health topics in trade journals, including business and financial journals, as a way of reaching business leaders.

4.1.2. Regulations and Standards

PtD concepts should be included in the Occupational Safety and Health Administration’s (OSHA) Voluntary Protection Programs (VPP) process. A national consensus standard should be developed on PtD and include tools and aids, especially for small businesses. The workgroup recommends that a national consensus statement, including NIOSH,

the National Safety Council (NSC), the American Society of Safety Engineers (ASSE), the American Industrial Hygiene Association (AIHA) and others, be developed and published to demonstrate the unity of government and professional organizations with regards to PtD. A Malcolm Baldrige-type award for PtD performance should be explored.

4.1.3. Multi-Business Guidance and Procedures

The need to create commitment and tools for small businesses is recognized. There may be value in identifying the core elements that have common connections to the Fortune 500 corporations and small machine shops. Working with industry associations to determine the best approaches for each industry is recommended.

4.2. Challenges

Government agencies (e.g., OSHA) are not emphasizing the hierarchy of controls; consequently there has been an erosion of this principle. The climate in industry is fast paced and is often focused on the near-term. Since PPE is very handy, easy to use, and a “quick” fix, efforts to emphasize the value of PtD will need to overcome this. Alternate solutions, in the absence of a PtD OSHA standard, will need to be identified.

4.3. Immediate Action Opportunities

PtD should be linked to financial ROIs and the findings published in business journals (Forbes, CEO, etc.). Professional associations should promote PtD policies and approaches. Free or low interest loans should be offered to small businesses for PtD ventures. PtD communication should be developed and coordinated with trade associations, ANSI, the Department of Commerce, as well as trade and technical schools, on the concept and value of PtD.

5. Research (Needs, Challenges, Opportunities)

5.1. Specific Goals and/or Important Areas of Focus

5.1.1. Identifying Gaps in Knowledge

A method for identifying good and best practices is needed. More information is needed regarding the frequency rates for the most severe injuries and those that have not declined. Research is needed to identify PtD drivers.

5.1.2. Business Case: the Economics of PtD

A predictive loss model should be developed. Industry drivers and blockers of PtD should be researched so management can be encouraged to adopt PtD principles using compelling, hard data that appeals to their motivations and addresses their concerns. Case studies, which demonstrate business value, should be scaled to small business using persuasive data. More research is needed for effective, simple ROI tools.

5.1.3. Applications/Method Effectiveness

Research on drivers that promote industry-wide PtD, while avoiding regulatory pressure, is needed. Applications that demonstrate how hazards are identified and risks are mediated, including practical demonstrations, will be most effective. A better understanding of the role of inadequate design in the incidence of serious injuries/illnesses and fatalities is needed. Linkages to indicate the effect of PtD on the severity of injuries/illnesses, and metrics to measure the effectiveness of the PtD initiative, need to be developed. Research into how surveillance systems can be enhanced and linked to workplace exposures to guide PtD efforts should be conducted. Finally, research is needed on PtD organizational dynamics, so that effective communication methods, both to industry and within companies, can be explored.

5.1.4. Developing Predictive Tools

Research is needed to develop tools that can be used to predict safety of a design. These tools would need to simulate various accidents/injuries and estimate the severity and frequency of them.

5.1.5. Assessing Risks Associated with New Processes and Designs

Collection of risk and exposure data to hazards not already being gathered is a priority of the group. Also of interest is research into the effectiveness of PtD in reducing the frequency and severity of occupational injuries and illnesses. The ability to predict is essential since PtD experience is lacking.

5.2. Challenges

There is reluctance on behalf of industry to share incidents. A fear of litigation may keep industry from sharing how inappropriate design contributed to an occupational injury or illness. Legal barriers to PtD research must be alleviated so data that currently are not available, including fatality report data can be pooled. Additionally, funding PtD research at universities must improve.

5.3. Immediate Action Opportunities

Recommendations include the formation of an industry consortium on PtD and the co-branding of the PtD logo, using the Energy Star from the Environmental Protection Agency (EPA), as an example. Development and publication of a model to calculate ROI, for both new designs and retrofits, should be a research priority. In addition, development of research projects that have joint support from a group of industry partners is supported.

6. Education (Needs, Challenges, Opportunities)

6.1. Specific Goals and/or Important areas of Focus

6.1.1. Business and Professional School Curricula

Although separate PtD courses in already-crowded engineering and business school curricula may not be possible; the inclusion of

case studies on the financial impact of PtD into existing courses at business schools to demonstrate the business justification for health and safety expenditures should be considered.

6.1.2. Engineering and Architectural School Curricula

Providing universities and colleges with PtD problems to incorporate into existing course work may be an effective way to reach students. PtD principles should be included in the design for environment coursework for chemical engineers. Since the curriculum for engineering students is geared to meet the requirements for Professional Engineer (PE), the PE exam should include PtD questions.

6.1.3. Textbook Authors and Publishers, Continuing Education

It may be beneficial to provide distance and e-learning courses on PtD, as a way of disseminating the PtD message to existing professionals quickly. NIOSH should expand its traditional audience, and include PtD articles in business journals and trade publications. OSHA training should incorporate concepts of PtD. While a “true” PtD course is needed, a cookbook approach may be the best option for small businesses. Continuing education may be the best model to drive PtD thinking into university curricula especially since many companies support continuing education for their engineers and health and safety professionals. Finally, CEOs and business owners can also benefit from PtD education, perhaps by using the NSC, ASSE and AIHA to facilitate training.

6.1.4. Licensure and Certification

PtD concepts should be included in PE questions. In addition, board certification exams, such as the Board of Certified Safety Professionals and the American Board of Industrial Hygiene, should include questions on PtD. Offering Continuing Education Units for web-based, distance-learning coursework on PtD, would assure a quick dissemination of the concepts. Finally, including health and safety PtD capstone design projects should be discussed with the Accreditation Board for Engineering and Technology certification.

6.2. Challenges

Educating college and university students in PtD principles is a long-term goal; however, there is an immediate need to educate those in positions of influence now. It will be difficult to translate research into usable education formats and curricula since little safety education is currently provided to engineering students and virtually none is provided to business students.

6.3. Immediate Action Opportunities

A virtual barraging of PtD principles to the trade journals and publications is recommended. Getting CEOs and recruiters to require PtD experience will create the pull for coursework on PtD. Including PtD themes at all future health and safety professional conferences is recommended. Finally,

web-based, distance learning coursework should be developed and delivered quickly.

7. Conclusions

For the Manufacturing Sector, developing a “prevention through design” culture requires demonstrating the business

value of safety and health investments; educating engineers, architects, business leaders and health and safety professionals in PtD principles, creating a industry “pull” for professionals skilled in PtD and designing PtD programs specifically for small businesses.