Foresight of New and Emerging Risks to Occupational Safety and Health Associated with New Technologies in Green Jobs by 2020

Introduction to OSH issues
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Common Themes

- Decentralisation
- New materials
- Conflict between Green and OSH
- Rate of innovation
- Increasing automation
- Need for new OSH knowledge and skills
- Skills shortage
- Polarisation of workforce high-skilled jobs vs. precarious works
- Diverse workforce – fewer job opportunities in (highly skilled) green jobs for vulnerable groups incl. female/older/migrant/disabled workers?
Decentralisation

• Decentralisation of workplaces into smaller, dispersed units, incl. rise of sub-contracted work, self-employed and micro-enterprises: lower OSH awareness/culture and fewer resources for OSH
  – Small businesses, often with low OSH awareness, as provider of green services, e.g. cargo bikes for green delivery of people, goods and services

• Difficulty enforcing good OSH conditions and safe working practices in dispersed and difficult to reach workplaces with poorer access to OSH services (labour inspection, preventive services, training, etc.).
Decentralisation - Manufacturing

3D-printing
- dispersed locations,
- mass customisation,
- difficulty to define and enforce standards for safe work as products are one-offs
- integrity of products,
- widespread storage and use of a variety of chemicals for a variety of one-offs products,
- inexperienced workforces.
“Hello - how may I help you??”

(...I used to work just in retail... 
Now I am expected to be a manufacturer as well. I just press the buttons and hope it is OK!)

I’ll have a Zpad4.2 ... in lime green and purple ... and a cup of coffee while I wait please
Decentralisation – Renewable Energy

• Distributed, small scale installations
• Non-standard installations: risks to maintenance workers
• New entrants without necessary skills
• Sub-contracting
• Retrofitting
  – Dust, lead, asbestos, work at height, etc. – risks not new but in new situations
  – Re-insulation of buildings: exposure to insulation materials, e.g. MMMF
  – Roof spraying of polyurethane foam insulation: OEL for isocyanate exceeded
Local bio-gas with livestock management

bio-mass landscapes with community power generation

Autonomous housing with micro-generation

Integrated industrial ecology systems
New Materials

- Nanomaterials
- Composites
- Biomaterials
- Ceramics
- Smart Materials
- Quantum Materials
- Metal organic frameworks
- Plastic electronics
New Materials

• Manufacturing
• Biotechnology
• Waste handling
• Batteries
• Construction

⇒ (New, long-latency) work-related diseases from new materials?
- Difficulty to trace diseases back to jobs without exposure registers
Green construction materials

- New materials: nanomaterials, phase change, heat storage chemicals, aerogels
  ⇒ prior health impact assessment needed
- Renewables, e.g. wood, bamboo, straw, sheep wool, etc
  ⇒ dust, allergens, moulds, endotoxins and possibly chemicals
  - Flakes or flax wool impregnated with Borax: fire retardant and antimicrobial but also reprotoxicant
- Recycled materials:
  - Fly ash (PAH, cadmium, mercury, nickel, chromium) and asphalt (PAH) as filler in concrete
  - Steel from recycled metals containing lead ⇒ need for better material quality control
So - any idea what's in Silo number 2 today??

No idea... But we got to get it out of here before the morning shift.
'WIN-WIN' - WASTE

Our automated waste recovery extraction and intelligent re-use technology is the best available...

But how do we know if new kinds of hazardous waste are getting into new kinds of places ???
Conflict between Green and OSH

• Political pressure – grants, subsidies
  – OSH risks from work rushed before subsidies’ withdrawal
  – In-house waste treatment due to high waste disposal charges: risk shifting from professional waste operator to waste producer

• Hazardous materials and processes
  – Higher incident rate in green-certified construction projects
  – Re-furbishing: OSH risks from the re-use of old equipment
  – Sealed buildings

• Waste disposal

• End of life - Recycling
  – Green construction sites: 2 to 3x more manual work due to on-site waste separation
‘DEEP GREEN’ - WIND ENERGY

Look at that turbine - way beyond its design life!!
We can only get refurbished spare parts these days...

It is exhausting to spend all day climbing up these old turbines without lifts... I wish we had new ones
Have you thought about investing in automated landfill resource extraction & recovery?

Who needs to invest in automation when you’ve got all these cheap workers??
Innovation and Automation

• Increasing rate of innovation
• Increasing levels of automation in all sectors
• Increasing complexity
• Human machine interface
• Cobots
• Over-reliance on computers
now that robots or “co-bots” do most of the work.... What’s there to worry about ???

Boredom ... insecurity ... Keeping up with innovation ... And, what if they do not keep out of our way...

+++ THIS HUMAN HAS A POOR TRAINING RECORD+++ KEEP HER UNDER ACTIVE SURVEILLANCE +++
Do you think this new "platoon" technology is going to be totally safe??

How safe is safe ?? ... At least I can catch up on my e-mails whenever I want
Automated construction

• Offsite manufacturing of building modules has improved safety on construction sites
• New risks from use of new substances and materials
• Issues on construction site from mixing automated activities with manual ones

Construction ?? - it’s all ‘prefabrication’ these days. Much less manual work.

Yeah - look at this one - "carbon epoxy fibre laminated cement extrusion, with all services installed. Just hope the ‘plug and play’ water and electricity connections are clearly labelled.
Increasing reliance on electricity

• Electric vehicles
  – Risks in maintenance
    • Workers unaware of high voltages (360-500V)
  – Risks to emergency services
  – Risks not confined to the vehicle
    • End-of-life batteries for vehicle service re-used to store electricity in buildings
  – Risks from fuel cells

• Electricity for heating of buildings
  – PV risks to installers
  – PV risks to fire services
“Yes these ex-car batteries should be fine, no service record but never had any problem...”

“No need for guarantees... I just need 20 units for the home system”
• "Construction" hazards combined with electrical hazards
• Manufacturing - involves large quantities of chemicals - many highly toxic
• Leaching hazard, including at the waste treatment stage
• PV remains live even when the mains supply is cut - risks for emergency workers
**Picture and cartoon credits**

- **Picture on slide 20:**
  - Felix Kramer (CalCars)

- **Picture on slide 22:**
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