

## ME3619 Group Assignment

### Integrated Health, Safety & Environmental (HS&E) Management of a named Product/Process

**Weighting:** 30% of module. **Deadline:** 06/04/2022

#### Learning Outcomes

- ✓ Be able to identify and prioritise occupational health & safety, environmental and socio-economic risks associated with a named product/process/sustainable development issue
- ✓ Apply stakeholder analysis to identify stakeholders and their perspectives
- ✓ Apply FMECA, FTA and life cycle-based method (eco-audit) to assess risks over the product/process life cycle and suggest re-design /improvements / mitigation
- ✓ Interpret results from risk assessments including options-appraisal to propose appropriate actions that are BATNEEC using an integrated management approach.
- ✓ To know which ISO standards and legislation should be applied for assessment and management of different risk categories.
- ✓ To develop skills to operate ethically, responsibly, and sustainably, protecting the environment and community while meeting business objectives.
- ✓ Be able to inform the relevant stakeholders in a clear and engaging manner, regards product/process HS&E and environmental issues and argue an integrated solution to mitigate impacts.

#### Professional Development

- ✓ *Written communication skills*: succinct expression and logical ordering of pertinent information, easily read and engaging power-point slides (use of citations and consistent formatting).
- ✓ *Team-working*: communicate and work effectively in a team and mitigate any team issues affecting deliverables
- ✓ *Cognitive skills*: construction of an argument and ability to defend your position
- ✓ *Practical and technical skills*: technical and environmental assessment tools, international standards etc.
- ✓ *Project management skills*: time management, prioritising issues, compliance requirements for different sectors and knowledge of risk and life cycle-based assessment tools using an Integrated Management Approach (ISO 45001, ISO 14001, ISO 9001 etc).

#### The Presentation

Your aims are to identify, prioritise and evaluate risks in your CASE STUDY as perceived by the priority stakeholders, and recommend appropriate mitigation actions for effective management of these. Your group will be assessed on their ability to understand different viewpoints of stakeholders and make informed decisions, following due appraisal of options in an ethical transparent manner and then communicate these effectively, to a diverse audience. The subject of your group's work can be a specific named product (e.g. Airbus 350), a process (carbon fibre recycling) or a sustainable development scenario (e.g. installation of a wind farm, High Speed Rail 2 (HS2), fracking, for example) where your aim is to improve sustainability by proposing BATNEEC (*Best Available Technology Not Entailing Excessive Cost*) mitigation to address quality, H&S, environmental and socio-economic impacts, providing a good

compromise to satisfy priority stakeholders, in a transparent manner. You are encouraged to take inspiration from topics that complement your final year dissertations, future career path or personal interest.

Each team of 6 students, will work together equally to prepare and deliver the presentation and participate in the debate following their presentation. Teams should apply assessment tools learnt in this module to their topic (at least one FMECA, FTA, ETA and eco-audit analysis are required). Each group member will work **equally** towards organising, preparing, and delivering the oral presentation. You can use voice-over during slide presentation in PowerPoint or record a video (choice is yours). DO NOT EXCEED 10 minutes. Upload one PowerPoint presentation (.ppt) or video (.mp4) with the file name containing the words Group X, to the ME3619 Assignment Submission Folder in Blackboard.

**IMPORTANT:** Any issues regarding individual contributions to group work should be alerted to me within 4 weeks of setting the assignment. This is sufficient time to assign roles at a kick-off meeting and have a second meeting. You must keep evidence of meetings (eg. emails, whatsapp group chat) and inform me as a matter of urgency if members do not **actively** contribute work. This does not mean simply being “present” at meetings, but active contribution. Each member should contribute to delivering and recording the oral presentation.

You will be assessed on (see marking schedule in appendix):

- your ability to understand different viewpoints of stakeholders and make informed decisions following due appraisal of options in an ethical transparent manner.
- how you can communicate these effectively to a diverse audience.
- how well you have applied probabilistic risk assessment (FMECA, FTA, ETA) and eco-audit.
- interpreted results and made appropriate BATNEEC (Best Available Technology Not Entailing Excessive Cost) decisions regards interventions/mitigation to improve the product/process over its life cycle (risks include quality, environmental, health & safety hazards).

### **Presentation Instructions and Marking Scheme**

Presentation lasting **10 minutes**, containing the following elements;

#### **1) Problem Formulation** (weighting 15%)

Describe your product/process (e.g. block diagram, conceptual model) and then identify the potential hazards (environmental, socio-economic, quality, financial, health & safety), identify relevant stakeholders (stakeholder analysis **required**) and their perspectives (don't forget to state which stakeholder you are). Set scope and boundaries of the analysis (acceptability criteria e.g. RPN cut off, environmental emission limit, etc). Cite relevant regulations influencing your acceptability criteria.

#### **2) Impact Assessment** (weighting 45%)

Present risk assessment data on impacts from relevant risks (e.g. environmental, socio-economic, quality, financial, failures) associated with relevant products/services/processes. FMECA (before & after with mitigation), FTA, ETA and at least one LCA-based analysis (e.g. eco-audit, LCA, carbon footprint, LCEA) for environmental evaluation (all compulsory elements except ETA)

#### **3) Evaluation & Mitigation** (weighting 30%)

Your options appraisal and resulting decisions. Suggest re-design and interventions/mitigations to improve the quality (reliability), safety and environmental performance of the product. Show whether the residual risk acceptable and ALARP, declare your level of certainty and cost benefit appraisal to justify BATNEEC options? Propose your integrated alternative solutions for an alternative outcome for your case study whilst addressing concerns of stakeholders.

4) **References** – One slide maximum at the end to cite references

5) **Oral Presentation** (weighting 10%)

You will be assessed on the quality of your visual aids, pace of the presentation, the logical ordering and balance of information presented, the quality of speaking and engagement with the audience.

### Helpful hints:

**Choosing your Products** - These should be well-defined and the simpler the product the better. It has to have at least 5 parts but if you choose something more complicated, then choose a simple sub-system within that product and delineate this within your system identification block diagram at the start (e.g. battery in an ELV). Here are some examples:

- *Generic* – mobile phone, laptop, PC, blood pressure meter, digital thermometer, modem, router, pressurized storage container, water pump, emergency generator, battery, fire extinguisher, 3D printer, water sprinkler system, coffee machine, kettle, toaster, domestic appliance.
- *Aerospace* – aircraft passenger seat, Crash-worthy pilot seat, landing gear, Wings, fuselage, fuel.
- *Automotive* – vehicle seat, vehicle chassis, tyres, battery, fuel
- *Sustainable Energy Technologies* – wind turbine, Photo voltaic, Domestic Boiler, heating or cooling system.

**Choosing a Sustainable Development Issue** - These should be a well-defined issue with boundaries set (time-space) as SD issues can be huge. Pick a small element of the issue and focus on that, where it is sufficient material to apply your newly learned risk assessment and eco-audit skills. The simpler the issue the better (try to avoid those with multiple stakeholders). Here are some examples of SD issues and some ideas to get your mind flowing for each (not exhaustive, just idea starters):

- *Installation of a de-salination plant in a Muslim country* (choose an area with water shortage and research it) by a non-Muslim Multi-national contractor. Focus on the social issues regards the influx or workers and their impact on the local community, you can pick a sub-component of the de-salination plant that has the highest issues with robustness and use FMECA/FTA/ETA for that. Eco-audit for the energy-use and water footprint would attract more marks.
- *High Speed Railway 2 (HS2)* focus on one of the councils affected not all of them OR look at the whole system but in less detail. For example, comparing the whole railway before and after to see if it really does offset CO2 in England! Lots of data publically-available on this topic. Carbon footprint would be needed but you can apply FMECA/FTA/ETA to some of the safety systems (e.g. signal failures, fallen trees to explore the safeguards in place etc).
- *Wind farm Installation* – explore the views of the local community, energy audit, impact of clearing trees, assess failures of wind turbines etc.
- *Third Runway at Heathrow* - local resident impacts, cost-benefits (local/national), risk from increased road and air traffic on air quality, noise, particulate pollution etc.

**Your risks/hazards/issues** – take a risk management approach you cannot look at everything in 10 minutes, so pick your poison! Go with something you feel you can dig your teeth in to and show your skills. Look at all the possible risks/issues and decide for yourself – either choose one that has the most impact or one that might not have the most significant impact, but you feel you can make a real contribution to.

**FMECA** - Examine the main components of your product/system in fault condition. Decide an *RPN cut-off point* for triggering mitigation action. Don't forget to justify how you scored severity (S), occurrence (O)

and detection (D) before the FMECA (on 1 slide max). Demonstrate effectiveness of any risk mitigation in FTAs by rescoring (S/O/D) values and recalculating RPN.

**FTA and ETA** – which and how many to be presented should be decided by the team in accordance with priority areas for risk mitigation. For FTA address an appropriate top event failure for a priority component fault from your FMECA. For ETAs address an appropriate initiating event relevant to system/product safety or performance. Identify consequences and probability of them occurring. If there are no probability data for your FTA or ETA use your own judgement. Use the data to justify what you mitigate (criticality).

**Life Cycle based Tools** – you could use one or more of a range of tools such as full LCA (using Gabi or Simapro software), but an EcoAudit (for which you have been trained) will suffice which constitutes an energy audit and carbon foot-print (and costing with enhanced Eco-audit). Remember like FMECA (and recalculated FMECA), justify how proposed mitigations compare with current situation, presenting “before & after” eco-audit results.

**Recommended Reading** - lecture notes and resources given there. For debating and presenting try M Gentile (2012) Giving Voice to Values: How to Speak Your Mind When You Know What's Right ([http://digitalcommons.sacredheart.edu/cgi/viewcontent.cgi?article=1147&context=wcob\\_fac](http://digitalcommons.sacredheart.edu/cgi/viewcontent.cgi?article=1147&context=wcob_fac))

ME3619 Assignment 2022						
Delivering an Integrated Management Solution						
Oral presentation and Slides						
Assessor: Dr G Troisi						
Group Number:						
	done?	Appropriate?	Correct?	Technically detailed?	Notes	Grade
<b>Problem Formulation</b>						
Scope & Boundary Definition						
System Identification (eg. system block diagram, PLC, FU?)						
Hazard Identification						
Stakeholder Analysis						
Citation of Relevant regulations & ISOs						
<b>Impacts Assessment</b>						
FMECA (S/O/D definition? RPN cut-off?)						
FTA						
ETA						
LIFE-CYCLE BASED ANALYSIS (eco-audit at least)						
<b>Evaluation &amp; Mitigation</b>						
Re-calculated FMECA						
Critical evaluation (options appraisal & decision-making)						
Selected mitigations - BATNEEC?						
Is residual mitigated risk ALARP?						
<b>References included?</b>						
<b>Oral Speaking &amp; Presentation</b>						
Clear & well-paced within time						
Clear & succinct graphics & text on Slides in logical order						
<p style="text-align: right;"><b>INTERIM MARK &amp; GRADE</b></p> <p>Final GRADE is not the calculated by summing/averaging each element. It is intended to reflect how the group prioritised, integrated and presented from an Integrated Management Perspective.</p>						
<p><b>Please note:</b> The University penalty system will be applied to any work submitted late. This interim grade does not reflect any late penalties that may be applied and is subject to approval by the Panel of Examiners.</p>						

