

Project “Accelerating energy efficiency (EE) in large industries through energy management system, system optimisation and the promotion and adoption of EE in SMEs” (IEEP)

EXPERT TRAINING PROGRAMME

ENERGY MANAGEMENT SYSTEM IN LINE WITH ISO 50001 (MODULE 3)

Ha Noi, 26 - 28/02/2025



AGENDA

EXPERT TRAINING ON ENERGY MANAGEMENT SYSTEM IN LINE WITH ISO 50001 (MODULE 3)

From 26 to 28 February 2025

Day 1: 26/02/2025

(At Adonis Hotel - 55 Quang Trung Street, Hai Ba Trung District, Ha Noi)

Time	Contents	Speakers
8.00-8.30	Registration and welcome	
8.30-9.00	Summary review of the management system and Q&A session	International Expert
9.00-10.15	Internal Auditing purpose driver and types	
10.15-10.30	Tea break	
10.30-11.45	Internal Auditing Planning Conducting the Internal Audit	International Expert
11.45-13.15	Lunch at the Hotel	
13.15-14.15	Internal Auditing Planning Conducting the Internal Audit	International Expert
14.15-15.00	Planning the Internal Audit Checklist	International Expert
15.00-15.15	Tea break	
15.15-15.45	Planning the Internal Audit Checklist	International Expert
15.45-16.00	Non-Conformances	International Expert
16.00-16.20	Reviewing and sustaining the system	International Expert
16.20-16.30	Certification to ISO 50001	International Expert

Day 2: 27/02/2025

(On-site training at two host plants in the north of Viet Nam)

Time	Contents	Speakers
6.45-7.00	Trainees gathering at the Adonis hotel and moving to the host plant by cars	All the class
7.00-9.00	Coming to the host plant	All the class
9.00-9.15	Introduction	Host plant representative and UNIDO
9.15-9.45	Opening Meeting Overview of significant energy users (SEU) operations	International Expert Learners from host plant
9.45-10.00	Overview of SEUs and general management system structure	International Expert Learners from host plant
10.00-12.00	Team 1: Review planning and implementation of EnMS Team 2: Review operational control checking of SEU 1 and roles and responsibilities	All the class
12.00-13.00	Lunch	
13.00-15.00	Team 1: Review operational control checking of SEU 2 and system checking Team 2 review planning and implementation of EnMS	All the class
15.00-15.30	Teams private review and report development (possible additional questions to be asked)	All the class
15.30-16.00	Closeout meeting with senior management of the host plant	International Expert All the class

Day 3: 28/02/2025

(At Adonis Hotel - 55 Quang Trung Street, Hai Ba Trung District, Ha Noi)

Time	Contents	Speakers
8.00-8.30	Registration	
8.30-8.45	Team 1 Audit Review presentation	All the class
8.45-9.00	Team 2 Audit Review presentation	All the class
9.00-10.00	Q&A on Internal Audit process	International Expert All the class
10.00-10.15	Tea break	
10.15-10.45	Management Review	International Expert
10.45-11.45	Exam Review Questions	International Expert All the class
11.45-13.15	Lunch at the Hotel	
13.15-14.15	Exam Numerical Example	International Expert
14.15-15.15	Optional on any topic groups want to work on	International Expert All the class
15.15-15.45	Tea break and closing	International Expert All the class

Energy Management System (EnMS) Expert Training

UNIDO International Energy Efficiency and EnMS Training

Module 3 Day 1

Delivered by: Richard Morrison, Stefan Walta

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Overview

- Overview of the 3 days
- Purpose
 - Improve energy performance
 - Improve the EnMS
- Day 1: Audits and performance evaluation and improvement
- Day 2: is an internal audit
- Day 3: reporting and final steps

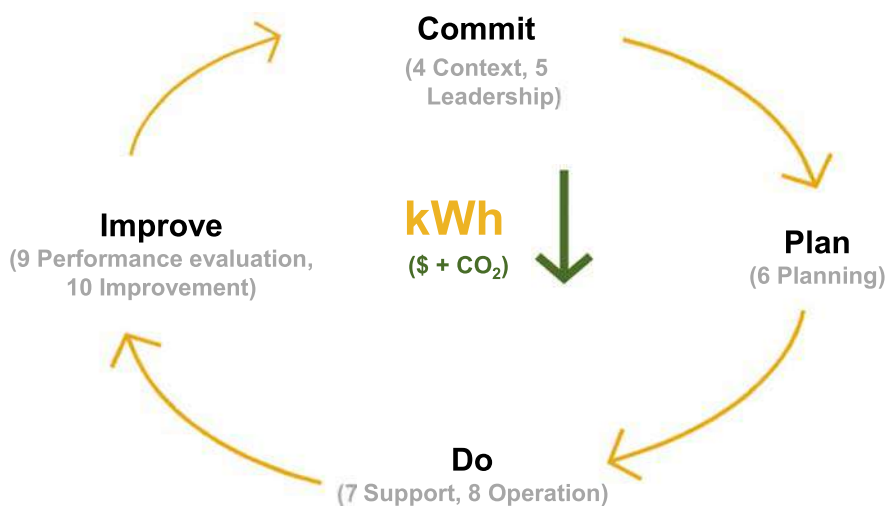


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Overview of the EnMS

To be delivered by a trainee
Informed in advance of the module

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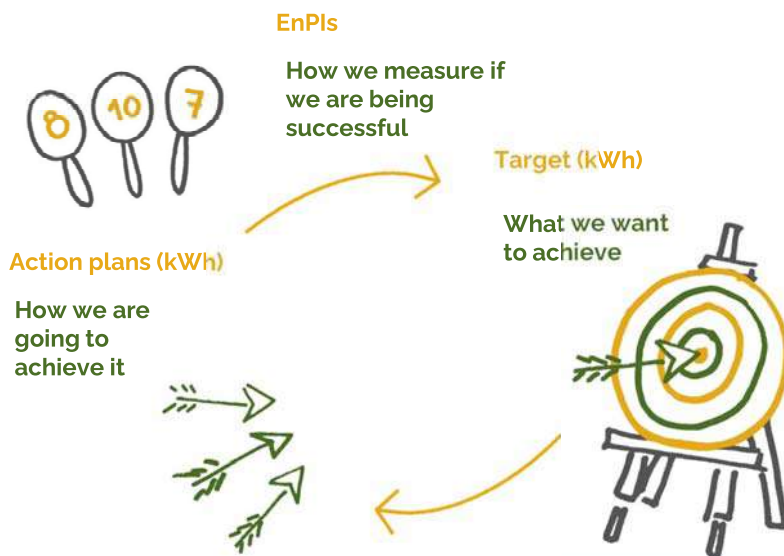


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Monitor and evaluate energy performance

EnPIs, Targets, Action plans, corrective actions

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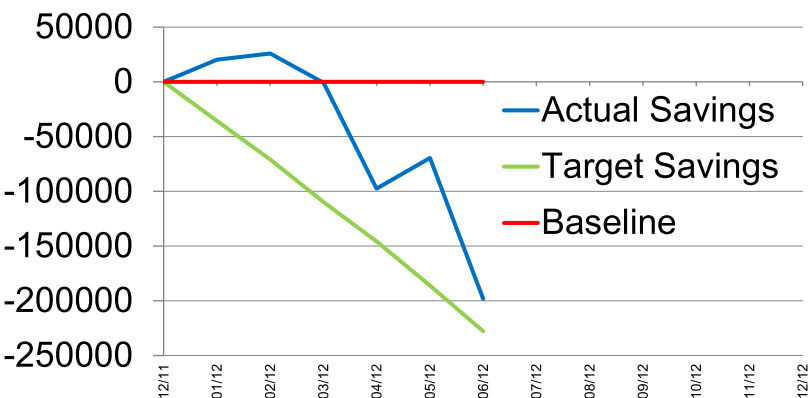
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Checking Performance

- EnPIs
- Baseline
- Savings targeted to date
- Savings achieved to date

7

Compare actual savings and target savings



8

Actual results of ESOs

Actual completion date	How are actual savings going to be verified	Actual electricity saving (kWh p.a.)	Actual Gas Savings (kWh p.a.)	Actual Water saving (m3 p.a.)	Actual cost savings (€ per year)	Actual CO2 Saving (Ton p.a.)	Actual Implementation Cost
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- When was each ESO completed?
- How much energy was saved?
- How much costs was saved?
- How much CO2 emissions were avoided?
- What was the actual implementation cost?
- Were NEBs achieved?

If you maintain the list, these answers are immediate and easy

Routine monitoring of energy performance

- What to do if savings are not as expected
 - Identify the reason and its cause
 - Take corrective action
 - Document this in the EnMS Continual Improvement (CI) List
 - Ensure it is not likely to happen again

Ensure compliance with legal and other requirements



Compliance with legal and other requirements

- Routinely check for compliance
- Follow up

What action is required	Resp	Reqd date	How often will this be reviewed	Compliance date	Does it require further action?
Generate and deliver	Agatha Chrisitie	Quarterly	Quarterly		N
	Umberto Eco				N
Monitor and report	Agatha Chrisitie	Continuous	Continuous		N
Estimate usage and cost	Umberto Eco	01/11/2016			N

Checking operational control

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Checking operational control

- Operator logs
- Critical operating parameters
- Operational control checks
- Operational follow up
- Maintenance records
- Maintenance follow up

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Internal Audits

Monitor and evaluate the EnMS and energy performance
improvement

Overview

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Internal audits

- What are they?
- When do they occur?
- Who performs an Audit?
- How to plan and schedule them
- How to follow up

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Internal audit

- It is not an energy audit
- Is everything working as expected?
- Is everyone doing what is expected?
- Are the objectives and targets being achieved?
- Is energy performance improving?
- What is a non-conformity (NC)?
- What is a corrective action?
- Importance of documentation
 - Maintained and retained



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What is Auditing?

- Systematic
- Independent
- Documented process
- Obtaining and evaluating evidence
- Determine the extent to which the audit criteria are fulfilled
- Positive and negative findings

Source: ISO 19011

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What is an internal audit?

- Independent review of part or all of the EnMS
 - Is the EnMS effective in improving energy performance?
 - Is the EnMS operating as intended?
 - Is the EnMS improving?
 - Is it achieving its objectives?
 - Does the EnMS meet the requirements of a standard if certification is being sought, e.g. ISO 50001
 - It is an essential part of continual improvement

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An internal audit is not.....

- A technical energy audit
- An assessment of the viability of an energy saving opportunity
- An assessment of the energy efficiency of a process or system
- An assessment of the performance of individual people
- A battle between the auditor and auditee(s)

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Goal of an EnMS internal audit

Make an informed decision about the status of the management system with respect to intent, implementation, effectiveness and energy performance.



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EnMS focus

- Confirm:
 - EnMS integration in business processes
 - EnMS should be a routine activity
 - Continual improvement of energy performance
 - Continual improvement of the EnMS

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Energy performance focus

Confirm energy performance improvement:

- Confirm improvement in energy performance indicators
- Verify performance is measured against a baseline
- Verify energy objectives and targets are met
- Determine effectiveness of action plans
- Ensure significant deviations are addressed
- Ensure energy performance improvement opportunities are identified

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Who Performs the Audit?

- Internal — First-party audit
 - Self
 - Independent function
- External — Second-party audit
 - Energy Consultant
 - Sister company
- External — Third-party audit
 - Certification body



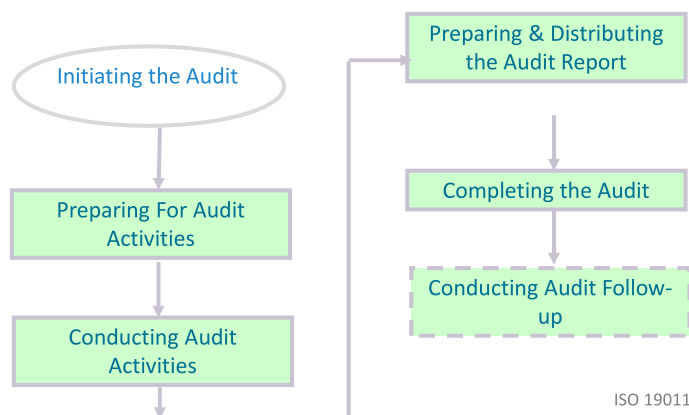
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The auditor

- The role is to find and report on verified facts found during the audit.
- Never:
 - Find fault in individuals
 - Attribute blame
 - Impose predetermined corrective actions
 - Pass judgement or be judgemental
- The auditor should:
 - Be mannerly and courteous
 - Not argue, either agree or disagree
 - Explain issues as they occur
 - Keep your composure and maintain sense of humour
 - Control the time spent on the audit

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Overview of Audit Activities



ISO 19011

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See you in 15 minutes!



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Internal Audits

Planning an EnMS audit

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Three Stages of Audit Activity

- **Planning for audits**
 - Schedules
 - Notifying auditors and auditees
 - Preparing checklist
 - Preparing an agenda
- **Conducting the audit**
 - Coordination with auditee
 - Interviews, observations and records
 - Auditor notes
- **Follow-up activities**
 - Reporting the findings (positive and negative)
 - Corrective actions

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Internal audit plan

Internal Audits plans					
Section	SEU	Jan	Feb	Mar	Apr
Context	Full scope of the EnMS	Charles Dickens			
Leadership	Operations		Agatha Chrisitie		
Planning	Facilities			Charles Dickens	
Support	Maintenance				
Operations	Facilities				
Performance evaluation	Full scope of the EnMS				
Improvement	Operations				

It is common to audit the full EnMS in one or two days annually

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Audit planning

- Audit Schedule
- Covers all auditable entities
- Generally an annual schedule
- Status and importance
- Audit results may change audit frequency
- Energy performance
- RESULTS



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Audit agenda

DAY 1				
Start	End	Duration	Topic	People involved
08:30	09:00	00:30	Opening meeting	Top management and energy team
09:00	09:45	00:45	Site and EnMS overview	Energy manager (EM)
09:45	10:45	01:00	Context	EM and MR
10:45	11:00	00:15	Coffee Break	
11:00	12:00	01:00	Leadership	EM and MR
12:00	13:00	01:00	Roles & Responsibilities	EM and energy team
13:00	14:00	01:00	Lunch	
14:00	16:00	02:00	Site tour	EM
16:00	16:15	00:15	Coffee Break	
16:15	17:00	00:45	Planning process	EM
DAY 2				
Start	End	Duration	Topic	People involved
08:30	09:15	00:45	Energy review: Data collection	EM and data person
09:15	09:45	00:30	Energy review: Energy balance and SEUs	EM and data person
09:45	10:00	00:15	Coffee Break	
10:00	11:00	01:00	Visit SEUs, check operations	EM and operations personnel
11:00	11:30	00:30	ESO list, action plans, objectives and targets	EM
11:30	12:00	00:30	Baselines and EnPis	EM and data person
12:00	12:45	00:45	Design and procurement	EM and responsible people
12:45	13:45	01:00	Lunch	
13:45	14:30	00:45	Support	EM and responsible people
14:30	15:15	00:45	Performance evaluation and improvement	EM
15:15	15:30	00:15	Coffee Break	
15:30	16:00	00:30	Prepare for closing meeting	Auditor(s)
16:00	16:45	00:45	Closing meeting and next steps	Top management and energy team

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Audit Schedule

- WHO
- WHAT
- WHERE
- WHEN

Process Area Month	Production	Maintenance	Internal Audit
Jan	Julie, Mark 4.4.3, 4.4.2, 4.4.6, 4.5.5		
Feb		Julie, Joe 4.4.6, 4.5.2, 4.5.5, 4.5.7	
March	Julie Follow up to Jan		Mark, Joe 4.6.3, 4.6.4, 4.7.2
April			

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Audit Methods

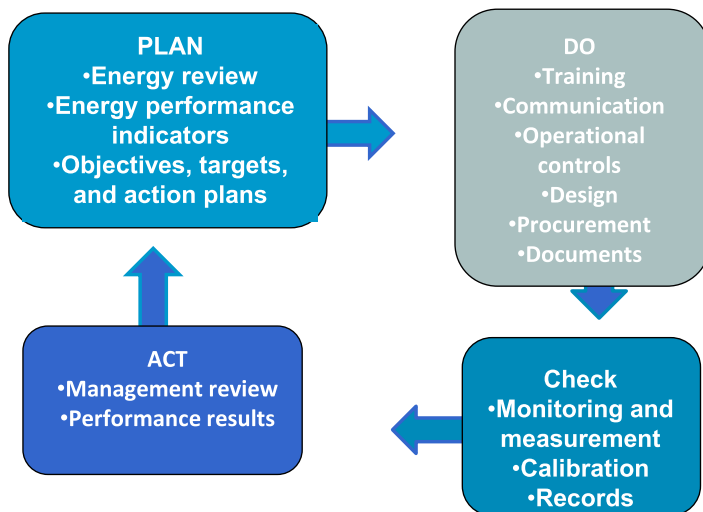
- Horizontal
 - By department plus interfaces
 - By section of ISO 50001
- Vertical
 - Downstream
 - [SEU(energy use and consumption) to Monitoring and Measurement (evaluation)]
 - Upstream
 - (monitoring and measurement to energy use and consumption)
- Process Audit
 - Significant energy uses
 - Objectives and targets
 - Internal auditing



- Combination

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Process Audit – Significant Energy Uses - PDCA



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Audit Evidence

- Based on facts and not opinion
- Evidence
 - Direct observation
 - Statement of fact
 - Documents, data, and records
- First-hand, verifiable
- Recorded



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Where Can Requirements Come From?

- Standards
- Procedures
- Forms
- Records
- Verbal statements
- Legal & other requirements



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The Auditor Checklist

- Serves as an auditor's guide for information gathering
- Tailored to the unique assignment and needs of the auditor
- Serves as a guide, *not a substitute*, for good interview methods



- Criteria #1
- Criteria #2
- Criteria #3...



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Checklists – Why?

- To fulfill scope and objective
- To define a representative sample
- To guide the auditor
- To ensure connections are audited
- To show evidence of planning
- To reduce auditor bias
- To organize notes
- To provide an audit record

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Checklists: Sources of Information

- Standard
- Manual/procedures
- Contracts
- Stated objectives
- Details of current corrective actions
- Previous audit results
- Auditor's understanding of science and technology



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Checklists: Sources of Information (Cont'd)

- Interviews with employees
- Observations of activities and work environment
- Records
- Data summaries and indicators
- Databases and web sites

Checklists: Look at... Look for...

Look at. . .	Look for. . .
➤ Some element of the EnMS	➤ Objective evidence of conformance

Checklists: Look at... Look for ... (Cont'd)

Look at. . .	Look for. . .
➤ 5 training records	<ul style="list-style-type: none"> ➤ Record of competency ➤ Record of awareness training ➤ Record of training on significant energy use

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Checklists – Intent

- Intent – SEUs
- Procedure for Energy Planning to address:
 - Method and criteria for energy review
 - Energy use and consumption past and present
 - Identify the facilities, equipment, systems, processes and personnel
 - Identification of relevant variables
 - Determine the current energy performance of facilities, equipment, systems, and processes related to identified significant energy uses
 - Estimate of future energy use and consumption

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Checklist - Implementation

- Implementation – SEUs
 - Methods and criteria for energy review
 - List of SEUs
 - Energy data for future energy consumption
 - Energy data for current energy consumption
 - Training for SEUs
 - Measuring identified for SEUs and Variables
 - Calibration schedule for measuring
 - Operational controls and maintenance for SEUs
 - Updates through management review
 - Communication
 - Assigned responsibilities

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Checklist - Effectiveness

- Effectiveness – SEUs
 - Improved energy performance
 - Improved data analysis
 - Improved energy information
 - Improved process, equipment information



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Checklist – Links for SEUs

Connections to Other Parts of the Standard:

- Document Control (Internal and External documents)
- Records Control
- Operational Control
- Calibration
- Energy Review
- Communication (internal and external)
- Responsibility and Authority
- Design
- Measuring and Monitoring
- Procurement
- Management review

Context checklist

ID	Task	Interviewee	Questions
4. Context			
1	External Context	Energy Manager	What are the external issues that relate to your current and future use of energy and your EnMS?
2	Internal Context	Energy Manager	What are the internal issues that relate to your current and future use of energy and your EnMS?
3	Interested Parties	Energy Manager	Who are the parties with needs, expectations and requirements related to your use of energy?
4	Identify all legal requirements applicable to the organisation's use of energy and comply with them	Energy Manager	Review legal requirements and check evidence of compliance
5	Define the boundaries of the EnMS	Energy Manager	What are the geographical and organisational boundaries of the EnMS?
6	Define the scope of the EnMS	Energy Manager	What are the energy sources in the scope of the EnMS? What activities are included and excluded?

Leadership checklist

ID	Task	Interviewee	Questions
5. Leadership			
7	Develop, publish and periodically review the energy policy	Energy Manager/Management Representative	Review the policy. Is it approved and communicated?
8	Define the different roles and responsibilities in the EnMS	Energy Manager and sample of personnel with energy roles.	Who is responsible for what? Does each person know and understand their role?
9	Ensure resources are available	Sample of energy personnel and the energy manager	Are there enough resources to implement the EnMS? Sample individuals to check if they have enough time to fulfil their roles
10	Top management will communicate the importance of the EnMS	Energy Manager	Review a sample of top management communications
11	Report EnMS and energy performance to top management	Energy Manager	Review a sample of the report

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Planning checklist 1

6. Planning			
12	Consider context (PESTLE and SWOT) in planning	Energy Manager	Where has the context been taken into account in developing energy plans?
13	Develop the methodology used for the energy review and what criteria are used	Energy Manager	What is the methodology used for the energy review and what criteria are used?
14	Collect energy data and develop consumption trends	Energy Manager	Review past, present and future energy use and consumption
15	Complete an energy balance and select the SEUs	Energy Manager	Review SEU list
16	Develop the energy saving opportunities (ESO) list including investments and operational control improvements	Energy Manager	Review ESO list including investments and operational control improvements

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Planning checklist 2

ID	Task	Interviewee	Questions
17	Develop the baseline and EnPIs for each energy source and each SEU.	Energy Manager	Review relevant variables affecting SEUs and review the current performance of SEUs. How is the baseline set and adjusted? How are EnPIs established?
18	Identify the personnel affecting energy use and consumption	Energy Manager	Which are the personnel affecting energy use and consumption
19	Investigate opportunities to reduce energy consumption in your technical systems	Energy Manager	What technical reviews have been carried to identify ESOs?
20	Develop action plans from the ESO list	Energy Manager	What are the action plans?
21	Set the objectives and energy targets taking account of the action plans	Top management	What are the objectives and/or targets?
22	Develop energy data collection plan	Energy Manager	What are the plans for measurement and data collections?

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Support checklist

7. Support			
23	Ensure that relevant personnel understand their roles, responsibilities and are competent for their own role in the EnMS implementation	Energy Manager	How is it ensured that relevant people (RnR and others) are competent with respect to their impact on energy performance and the EnMS
24	Implement training plans and maintain training records	Energy Manager	Review training plans and training records
25	Ensure people are aware of EnMS, benefits, roles, impacts, link of behaviour to objectives and targets, consequences of departure from procedures	Energy Manager and sample of relevant people.	How are people aware of EnMS, benefits, roles, impacts, link of behaviour to objectives and targets, consequences of departure from procedures.
26	Ensure energy performance and the EnMS are communicated internally	Energy Manager	How are energy performance and the EnMS communicated internally?
27	All personnel need to be given an opportunity to comment and make suggestions to improve the EnMS.	Energy Manager	How can personnel comment or make suggestions to improve the EnMS?
28	Decide if there will be external communication.	Energy Manager	How is external communication managed and documented?
29	Develop a process to manage and control documented information	Energy Manager	How are documents and records controlled?

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Operation checklist

8. Operation			
30	Ensure operational and maintenance criteria for SEUs are met	EM/operational and maintenance personnel	Review operational and maintenance criteria for SEUs and how they are documented, communicated and controlled. Review records to show that critical instruments are accurate
31	Ensure that new projects (including modified or renovated systems) with a significant energy impact are evaluated from an energy perspective	EM/Design personnel	How is energy performance considered in design of new, modified or renovated systems?
32	Decide the criteria for assessing energy use, consumption and efficiency over the lifetime of products, equipment and services	EM/procurement personnel	Have suppliers been informed that procurement is partly evaluated based on energy performance. What are the criteria for assessing energy use, consumption and efficiency over the lifetime of products, equipment and services?
33	Investigate opportunities related to the procurement of energy	EM/procurement personnel	Review samples of energy purchasing specifications and saving opportunities related to energy tariffs.

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Performance evaluation and improvement checklist

9. Performance evaluation			
34	Monitor and evaluate energy performance	Energy Manager	How are actual and expected energy consumption compared and what action is taken when unexpected results are found?
35	Ensure that the objectives and energy targets are being achieved	Energy Manager/top management	What are they for the current year and the coming year if the review is late in the year? How are they set? Are objectives and targets being achieved?
36	Evaluate compliance with legal and other requirements	Energy Manager	What is the status of compliance?
37	Schedule and organise internal audits of the EnMS	Energy Manager	Review the internal audit plan and schedule
38	Attend the management review meeting	Energy Manager	Review previous management review meeting minutes, notes, presentations, and plans.
10. Improvement			
39	Manage non-conformities and corrective actions related to the EnMS.	Energy Manager	Review non-conformity management and corrective actions

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Expert's Role in Internal Audit Planning

- Help organization develop audit schedule
- Ensure audit coverage of EnMS
- Provide guidance on auditing energy performance
- Assist in determining most effective audit method(s)
- Ensure audit activities have been addressed
- Provide guidance on checklist development



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Typical Barriers

- Failure to organize the audit program
- Failing to plan audit activities
- Lack of auditor training
- Neglecting energy performance component in audit plan
- Failing to develop checklist
- Inadequate document review
- Limited/no communication with auditee
- Inadequate auditor resources



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Value to the Organization

- Audit planning improves effectiveness
- Minimizes resources
- Minimizes process interruptions
- Improves competence of auditor and auditee
- Provides focus on critical areas
- Provides focus on troublesome areas



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Documents & Records

Documents

- Audit schedule
- Audit plan
- Auditor training requirements

Records

- Audit records
- Auditor training records



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Deliverables

- Select and train internal auditors
- Develop audit schedule for the next 12 months
- Develop audit plan for upcoming internal audit
- Perform internal audit
- Include internal audit findings in corrective action system



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See you in 15 minutes!



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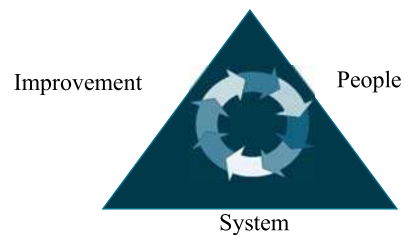
Internal Audits

Conducting the audit and follow up

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What is an ISO 50001 Audit?

- Does the system in place meet the requirements?
- Do we do what we say?
- Is it working?
- How can we improve?
- Communication



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An ISO 50001 Audit is NOT:

- A compliance audit
- An energy assessment
- A management review
- Pass/fail



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Overview of Audit Activities



ISO19011

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Three Stages of Audit Activity

- **Planning for audits**
 - Schedules
 - Notifying auditors and auditees
 - Preparing checklist
 - Preparing an agenda
- **Conducting the audit**
 - Coordination with auditee
 - Interviews, observations and records
 - Auditor notes
- **Follow-up activities**
 - Reporting the findings (positive and negative)
 - Corrective actions

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Audit Requirements - Summary

- Performed in an objective and impartial manner by trained, competent auditors
- Represents a “snapshot” of how the management system is functioning in the whole organization
- Collect sufficient evidence to support audit findings (positive or negative)
- Audit findings serve as a basis for the audit report and targeted corrective actions, improvements, etc.

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Audit Activities

- Opening meeting
- Communication during the audit
- Roles and responsibilities of guides
- Information-gathering and verifying
- Nonconformities and positive findings
- Preparing audit conclusions
- Closing meeting

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Interview Protocol

- Introductions
- Explain purpose
- Ask for relevant documentation
- Satisfy sample defined in checklist
- Consider any additional trails



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Interview Protocol (Cont'd)

- If no problems – continue audit
- If problems – establish the facts
- Get agreement on facts
- Inform auditee of findings
- Thank auditee



BE POLITE

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Interviewing Techniques (Cont'd)

- Avoid questions that lead to useless information or no information
- Be a good listener
- Reflect information back to auditee to check understanding
- Coordinate and cross-check with other auditors



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Evidence

Evidence is collected typically through three methods:

- interviews;
 - observations;
 - review of documents and/or records
-
- Evidence should be related to the intent, implementation or effectiveness of the system.
 - Only information that is verifiable should be accepted as audit evidence.
 - Evidence relevant to the audit topics should be recorded.

Evidence

- Sampling is used during an Audit
Not every document, record or person can be reviewed
- Responsibility and authority needs to be established before accepting the evidence
- Always review the information with the auditee prior to leaving the area
- Record the details so evidence can be reproduced –
if the organization can not recreate the situation they can not fix it.

Taking Notes

- Auditors must take clear, complete, and accurate notes
- Notes should not be secret from the auditee



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Taking Notes (Cont'd)

- Auditor notes
 - Define the audit sample actually examined
 - Get details – Version, readings, position, etc.
 - Use shorthand – E.g. + for positive, N/C for nonconformity, → for follow up
 - Record the results of the audit
 - And the basis for the audit findings
- Do not use tape recorders

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Taking Notes (Cont'd)

- Read over notes, as you can, to make sure they make sense
- Watch your time and make clear notes on anything you are not able to cover
- Cross check with the other auditors

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Following Audit Trails

- Consider significance of leads
 - Assess effects on audit plan
 - Inform lead auditor (if applicable) of changes
 - Let organization know
- Actions on new audit trails
 - May follow immediately
 - May pass to another auditor
 - May audit next time/later



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Auditee Reactions to Findings

- Asks for solutions
- Persists in arguing the facts
- Volunteers other facts
- Complains about others
- Questions significance of findings

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REMEMBER!

Purpose of the audit is to provide information to management. It is also to help employees get changes made and remove barriers.

It's not the people;
it's the system!



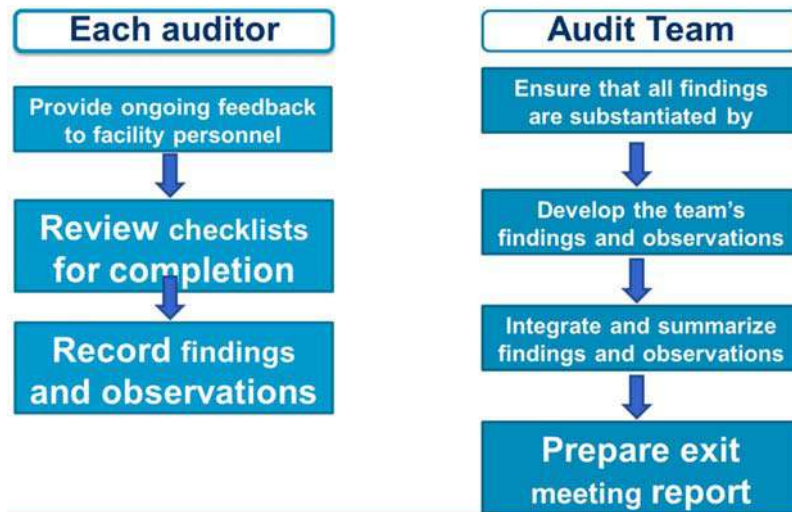
Auditors have a
great reputation;



but terror never provides good
information!

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Evaluating audit results



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Exercise

Prepare the internal audit plan for this week

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Internal audit agenda

1. Break into 2 audit teams for each factory
2. Select a lead auditor for each team
 - Do not use an experienced auditor
3. Select a recorder for each team
 - Use the IA checklist as the basis (to be prepared at the end of the day) of record keeping
 - Everyone should record their own observations
4. Develop the audit agenda (IA agenda tab)
 - You only have one day – (modify the 2 day agenda or make yourself)
 - Set times for each topic
 - Who do you need to meet?

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Three Stages of Audit Activity

- **Planning for audits**
 - Schedules
 - Notifying auditors and auditees
 - Preparing checklist
 - Preparing an agenda
- **Conducting the audit**
 - Coordination with auditee
 - Interviews, observations and records
 - Auditor notes
- **Follow-up activities**
 - Reporting the findings (positive and negative)
 - Corrective actions

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What is a Positive Finding?

- Practice matches requirements (criteria)
- Records demonstrate conformance
- Targets are achieved and demonstrated
- Beyond



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Positive Finding Write-up

- Can be written in criteria/evidence/reference format or any other format
- Should be specific



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Positive Finding Write-up (Cont'd)

- Well Written Positive Finding
 - The facility had an extensive awareness training for employees and contractors. The facility management held a monthly energy awareness meeting that included energy management awareness topics and included a slogan contest and door prizes.
- Poorly Written Positive Finding
 - The facility provided awareness training to employees as required by the standard.

85

What is a Negative Finding?

- Practice does not match requirements (criteria)
- Records do not support requirements
- Inconsistent answers
- System is not effective



86

Definition: Nonconformity

3.3.1

requirement

need or expectation that is stated, generally implied or obligatory

Note 1 to entry: "Generally implied" means that it is custom or common practice for the *organization* (3.1.1) and *interested parties* (3.1.5) that the need or expectation under consideration is implied.

Note 2 to entry: A specified requirement is one that is stated, for example in *documented information* (3.3.5).

3.3.2

conformity

fulfilment of a *requirement* (3.3.1)

3.3.3

nonconformity

non-fulfilment of a *requirement* (3.3.1)



87

Identifying Nonconformities

What are specific facts?

What department, line, activity...

What was observed?

What was said? By whom?

What does it not meet?

Which paragraph of ISO?



88

Nonconformity Write-up

- Well Written Nonconformity
 - Criteria (Requirement): SOP 123 revision B, dated 1/1/10, requires all documents be approved by the President.
 - Evidence: SOP 245 revision A, dated 3/1/10, in the waste water treatment plant was not approved by the President.
 - Reference (ISO 50001): 4.5.4.2

89

Reporting Procedures

- Everything remains proprietary
- No surprises after closing meeting
- Organize logically
- Meet the promised date
- Give all team members responsibilities
- Clarify items from the closing meeting

90

Audit Report Content

- Audit objectives
- Audit scope
- Identification of auditee
- Identification of audit team
- Dates and places of audit
- Audit criteria
- Audit findings, positive and negative
- Audit conclusions
- Any areas not covered
- Sampling
- Recommendations
- Statement of Confidentiality
- Distribution list

Source: ISO 19011

91

How to Follow up the Audit

- Auditor role in corrective action
- Closure with management
- Evaluate success
- Prepare for registrar



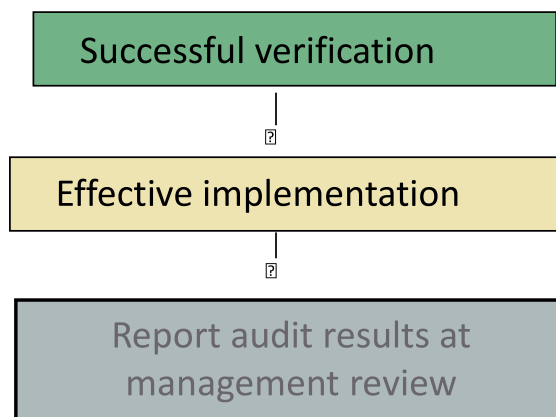
92

Auditor Role in Corrective Action

- Verify corrective action
 - Action taken?
 - Action effective?
 - All findings?
- Root cause, not symptoms, found?
- Any interim actions?
- When does corrective action take effect?
- Document acceptance
- Avoid “springboarding” into new findings

93

Closure with Management



94

Expert's Role in Conducting Internal Audits

- Provide guidance on interviewing
- Discuss ideas for effective note taking
- Ensure understanding of objective evidence
- Help determine format for writing nonconformities
- Encourage the use of positive findings
- Assist in defining audit report format and content

95

Typical Barriers

- Inadequate communication channels
- Audit timing issues and length and time availability for auditors
- Difficult access to relevant documents and records
- Logistic considerations
- Inadequate auditor tools



96

Typical Barriers

- Focusing too much on documentation
- Asking too many questions at once
- Starting arguments
- Talking too much - observing too little
- Making assumptions



97

Typical Barriers (Cont'd)

- Inserting bias from auditor's expertise and opinions
- Surrendering control of audit to auditee
- Failing to use time effectively
- Not devoting enough time to planning
- Not providing consideration for the auditee



98

Value to Organization

- Helps to determine what is and what is not working.
- Helps to generate ideas for energy improvement opportunities.
- Helps to improve understanding of the organization.
- Helps prepare employees for external audits.
- Ensures conformance to ISO 50001.

99

Documents & Records

- **Documents**
 - Audit schedule
 - Audit plan
 - Auditor training requirements
- **Records**
 - Audit records
 - Auditor training records



100

Tools

- Auditplan Schedule Template
- Example Audit Schedule
- EnMS Corrective/Preventive Action Request
- Checklist



101

Deliverables

- Select and train internal auditors
- Develop audit schedule for the next 12 months
- Develop audit plan for upcoming internal audit
- Perform internal audit
- Include internal audit findings in corrective action system



102

See you in 60 min 😊



103

Nonconformance, Correction, Corrective and Preventive Actions

104

What Does the Standard Require?

For actual and potential nonconformities:

- Make corrections
- Identify the root cause
- Determine appropriate actions
- Implement actions
- Record
- Review for effectiveness

105

Nonconformity

Nonconformity is a non-fulfillment of a requirement

Requirements can come from many places.

- ✓ ISO 50001
- ✓ Procedures
- ✓ Forms
- ✓ Records
- ✓ Verbal statements
- ✓ Legal and other requirements

106

Nonconformity Occurs When

- Organization does not meet the requirements of the ISO 50001 standard
- Organization does not meet the criteria it has established
- Management system is not effective
- Energy performance is not improving

107

Nonconformity Write-up

- Format - Records of nonconformity should consider:
 - description of or reference to audit criteria; e.g. reference ISO 50001 and/or EnMS
 - nonconformity declaration
 - audit evidence (Objective evidence)
 - related audit findings, if applicable.
- Best Practices
 - Criteria and evidence should include specifics
Who? What? When? Where?
 - Evidence and criteria sentence structure should read similarly to clarify the discrepancy.



108

Nonconformity Write-up (Cont'd)

- Poorly Written Nonconformity
 - Criteria (Requirement): The SOP requires all documents be approved by the President.
 - Evidence: A standard operating procedure in the waste water treatment plant was not approved by the President.
 - Reference (ISO 50001): 4.5.4.2

(Cont'd)

109

Nonconformity Write-up

Well Written Nonconformity

Non-conformity declaration: The waste water treatment plant was not approved by the Maintenance Manager, to communicate its authorization and to confirm that the technical content had been reviewed and was correct

Criteria (Requirement): SOP 123 revision B, dated 7 May 2018, requires all documents be approved by the Maintenance Manager. Reference (ISO 50001): 7.5

Evidence: Unapproved copy of SOP 245 revision A, dated 22 Feb 2019, in the waste water treatment plant.

110

Example Nonconformance

Criteria: EnMS Procedure #7 states the boiler stack excess oxygen must be in the range of 2.5 to 3.5 % during full load.

Evidence: The April 2010 records for the full load boiler stack excess oxygen indicated that on:

4/08/10 O ₂ was 6.2	4/22/10 O ₂ was 6.3
4/15/10 O ₂ was 6.5	4/29/10 O ₂ was 6.7

Reference: ISO/FDIS 50001, Section 4.5.5

111

Major or Minor

Major Nonconformity

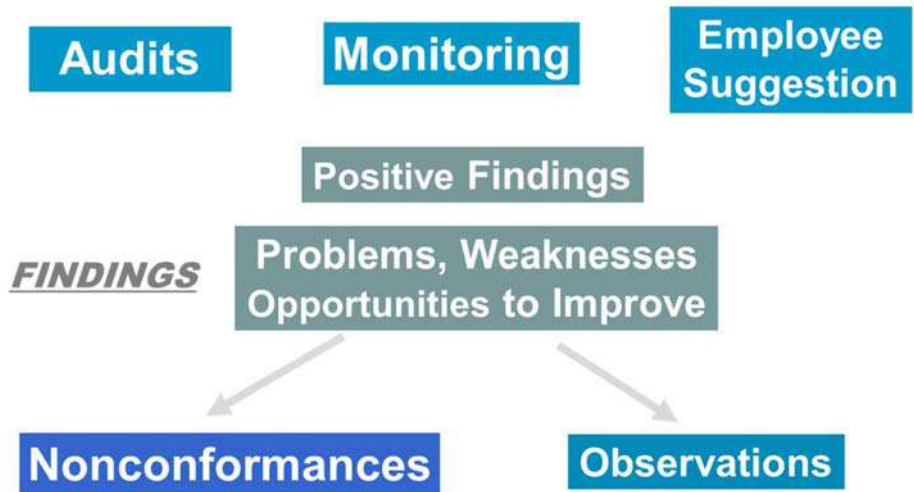
- Omission of requirement
- High degree of impact
- Accumulation of minor nonconformities

Minor Nonconformity

- Isolated case
- Minimal impact on system

112

Nonconformities



113

Corrective and Preventive Actions



114

Corrective and Preventive Action Processes

- Identify the problem and take immediate actions
- Investigate and determine the root cause
- Evaluate the need for action and develop a solution
- Implement the solution
- Record results
- Review for effectiveness



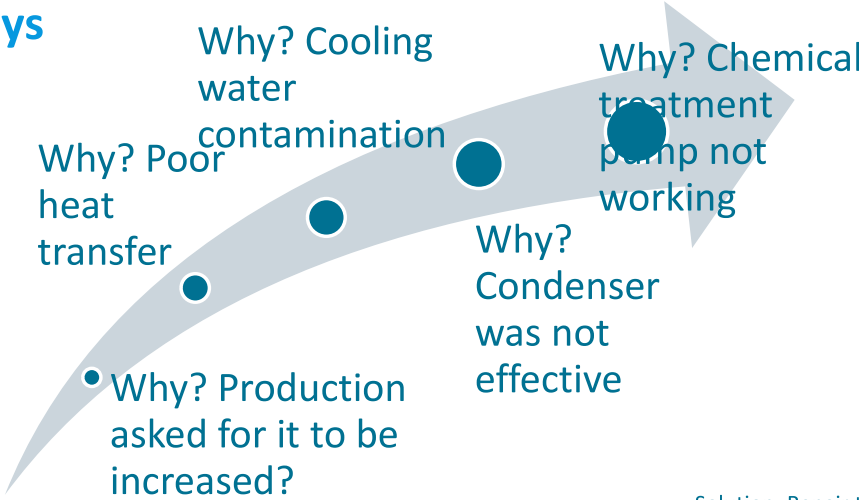
115

Root Cause Analysis

- 5 Whys
 - A technique that involves asking why until the question cannot be answered any further
- Fishbone diagram
 - A pictorial technique clearly showing cause and effect relationships
- IS/IS NOT
 - A technique that involves the comparison of two situations, one that exhibits the problem and one that does not, in order to determine the differences in the two situations

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Five Whys



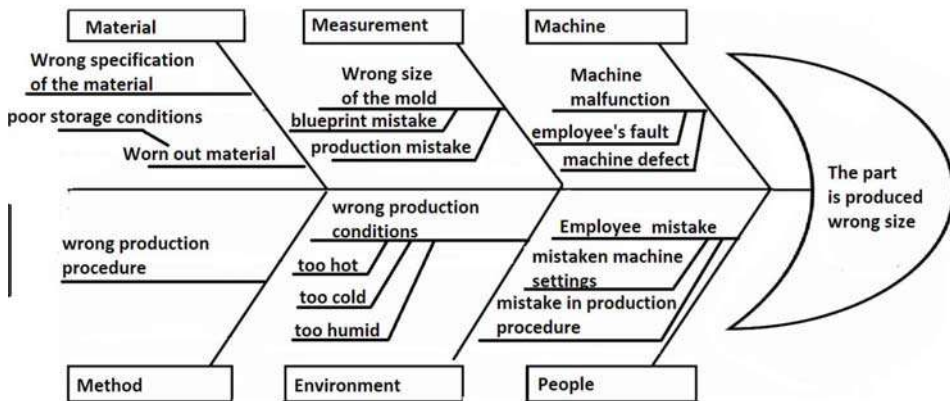
Problem: Cooling water pump pressure is too high

Solution: Repair the chemical treatment pump

Is/Is not analysis

	Is	Is not
What	Heating on in warm weather	Heating is not off in summer
Symptoms	Boiler is operating	Boiler is not off in summer
When	All year around	One season only
Where	Specific offices	Not all offices
Who	Occupants of specific offices	Occupants of all offices

Fishbone or Ishikawa diagram – cause and effect



119

Correction, Corrective and Preventive Actions

- Resolve the immediate or potential problem.
- Consider whether the same or similar problems exist elsewhere in the organization.
- Prevent the problem from recurring.
- Define the responsibilities and schedules for actions.
- Be evaluated regularly for effectiveness.
- Be tracked until they are closed.

120

CAPA #: **ISSUE DATE:** **COMPLETION DATE:**
 Name Department Phone

Requested By:
Issued To:

Problem Statement:
Including ISO 50001 Reference

Most Likely Causes:

Implemented Actions and Solutions:
Completed by recipient, including dates

Results:
Confirming effectiveness

Closed By: **Closing Date:**

121

Preventive & Corrective Actions Tracking Log

CAPA #	Source*	Assigned to	Issue Date	Due Date	Closed Y/N	Reported Y/N
80156	IA	Jill Johnson	3/1/2008	6/3/2008	Y	Y
80157	EnA	Ben Williams	3/1/2008	5/2/2008	Y	N
90100	ExA	Oscar DeLar	5/1/2008	7/31/2008	N	N

*Source

IA = Internal Audit
 MR = Management Review
 MM = Monitoring and Measuring
 EnA = Energy Assessments
 ExA = External Audits
 O = Other

122

Value to the Organization

- Robust elimination of root causes of energy performance deviations
- Continual improvement of the energy management system, process and performance
- Ensure timely resolution of issues

123

Success Factors

- If you have an effective corrective and preventive action system in use for another management system and it is effective, use it or replicate it!
- Ensure root cause process is thorough and appropriate.
- Corrective and preventive action detailed tracking is important to ensure issues across a facility are evaluated for similarities.
- Corrective and preventive action tracking is key to ensure timely resolution of issues.

124

Audit Report Content

- Audit scope
- Audit criteria
- Audit objectives
- Identification of audit team
- Identification of auditee
- Dates and places of audit
- General observations
- Non-conformities
- Good practice identified
- Processes/areas not audited
- Distribution list

Source: ISO 19011

Internal audit report template

- Word document
- Put IOs/NCs in the continual improvement tool in detail

Company Name

Internal Audit Report

Audit scope	
Criteria	
Objectives	
Audit team	
1.) Name of auditor, team leader	Date of audit
2.) Name of auditor, team member	
Audit summary	
General observations	
Non-conformities	
Good practices identified	
Processes/areas from Audit scope that haven't been audited	

Document is distributed to:

1. [job title]

2. [job title]

[job title]

[name]

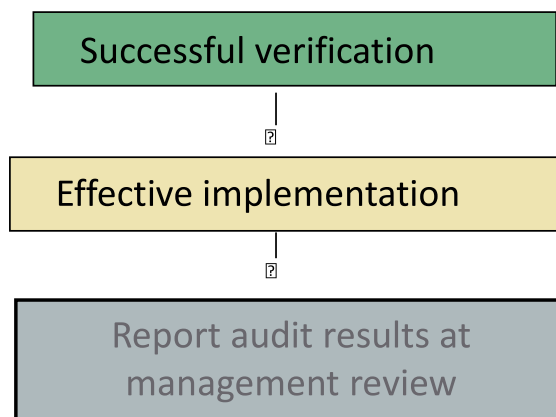
[signature]

Reporting Procedures

- Everything remains proprietary
- No surprises after closing meeting
- Organize logically
- Meet the promised date
- Give all team members responsibilities
- Clarify items from the closing meeting

127

Closure with Management

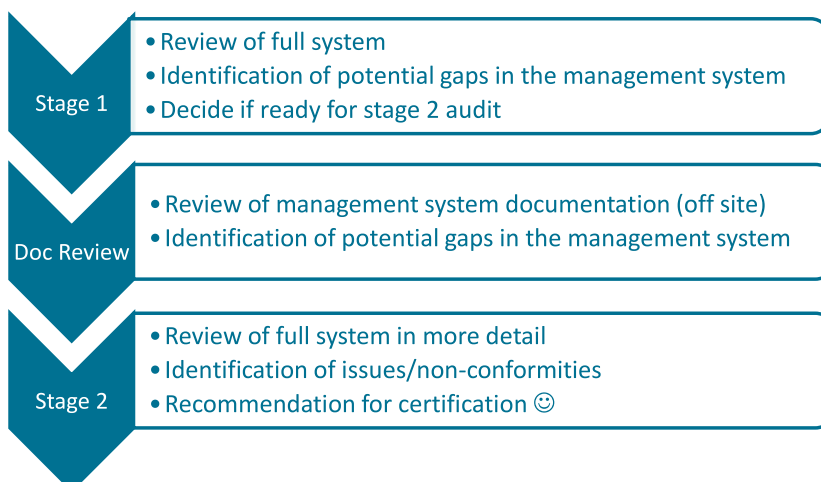


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Certification to ISO 50001:2018

129

Typically 3 step Process



130

Certification Findings

- Major Finding
 - Systematic failure; no recommendation for certification until the issue(s) has/have been adequately addressed
- Minor Finding
 - Failure of an element of the management system which if left unaddressed could lead to a major systematic failure
- Opportunities for improvement
 - Audit observations which will improve the management system

131

Certification Bodies & Notes

- Certification of your EnMS
- Accreditation of certification bodies
- ISO 17021-1
- ISO 50003
- The certification audit is similar to an internal audit
 - More formal due to external professional auditor
 - Less difficult due to lack of familiarity with issues
 - You want to find all issues in the internal audit and not in the certification audit.

132

Documents & Records

Records

- Corrective action records
- Preventive action records
- Effectiveness records

Deliverables

- Establish process for dealing with actual and potential nonconformities
- Include internal audit findings in corrective action system

Exercise: prepare the checklist

135

Logistics and plans for the site visit tomorrow

Address, identification, laptops, notebooks, phones

See you tomorrow

136

Questions?

Thank you

See you tomorrow

137

Day 1 End
Thank You

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Energy Management System (EnMS) Expert Training

UNIDO International Energy Efficiency and EnMS Training

Module 3 Day 3

Delivered by: Richard Morrison, Stefan Walta

1

Prepare the internal audit report

2

Prepare the report

- Both audit teams write the report from the previous day
- Check report requirements from slides
- Use the IA report template
- You have 45 minutes
- You cannot add new items since the closing meeting
- You need evidence for each finding

3

Audit Report Content

- | | |
|--------------------------------|-------------------------------|
| • Audit scope | • General observations |
| • Audit criteria | • Non-conformities |
| • Audit objectives | • Good practice identified |
| • Identification of audit team | • Processes/areas not audited |
| • Identification of auditee | • Distribution list |
| • Dates and places of audit | |

Source: ISO 19011

4

Reporting Procedures

- Everything remains proprietary
- No surprises after closing meeting
- Organize logically
- Meet the promised date
- Give all team members responsibilities
- Clarify items from the closing meeting

5

Present the internal audit report



6

Present the reports

- Both teams get 20 minutes to present their report to the group, 15 mins presentation, 5 mins Q&A
- The auditee should respond to all findings
- The auditee should add all accepted NCs and IOs to the CI tab (if possible).

7

See you in 15 minutes!



8

Management Review (MR)

9

Overview of the management review

- Opportunity to increase top management support
- Report status of the EnMS to top management
- Make decisions for the coming period
- Often held annually but more frequent meetings can be beneficial
- Critical to prepare adequately
- Communicate issues in advance
- Document all decisions, action items, responsibilities and due dates

10

The following slides can be used as a template for your own management review

Add text, images, tables, graphs, etc. to each slide to use at the review meeting

Participants will need a PPT version of these slides in advance to be able to do this exercise

11

Management review structure

- Status of actions from previous MR
- Achievements since last MR
- Overview/Changes in context
- EnMS performance trends
- Improvement opportunities including competence
- Energy policy
- Status of objectives and targets
- Energy performance improvements
- Status of action plans
- Decisions needed:
 - Improvement opportunities, policy, EnBs and EnPIs, objectives, targets and action plans, business integration, allocation of resources, improvement of competence, awareness and communications

12

Status of actions from previous management review

- Insert a table listing previous decisions and show their status
- Are any still incomplete?
 - Why?
 - What needs to be done to complete them

13

Highlights of Energy EnMS Achievements

- Have there been any notable achievements since the last meeting?
 - Major successes in terms of savings
 - Integration in business processes
 - Significant projects
 - Awareness
 - Awards or other recognition

14

Changes in external and internal issues – risks and opportunities

- List the changes and the resulting risks and opportunities (use the context tab)
- Discuss the proposed actions to address the risks and opportunities
 - Propose/Assign responsibility and agree due dates

15

EnMS performance trends

- NCs and corrective actions (summarise the CI tab)
- Results of any audits
 - Internal, certification or technical
- Status of compliance with legal and other requirements
- Agree actions, responsibilities and due dates

16

Energy Policy

- Review it in advance
- Request participants to read it in advance of the meeting
- Propose and agree any necessary changes

17

Status of objectives and targets

- Summarise current status
- Use CUSUM to show progress against savings targets for each energy source
- Other indicators used by the organisation
 - These could include:
 - Budgets and financial indicators
 - Emission reduction targets

18

Energy performance improvement

- Show the main EnPIs and progress against targets
- Describe the EnBs in simple terms
- Discuss any proposed ESO's for the coming period that need top management support
- Do the EnBs or EnPIs need to be changed?
 - Why?
 - Decide and document the decisions

19

Status of action plans

- Summarise the status of action plans
 - ESOs which are complete or have been planned for completion
 - Show savings estimated and actually achieved
 - Describe any barriers to completion
- Propose action plans and objectives and targets for the coming period
 - Make decisions and maintain records

20

Other decisions needed

- Are there changes to resource requirements?
- How will competence be improved?
 - Review training plan progress
- What are the plans for improving energy awareness?
- What are the communication plans?

21

Next Steps

What will you do?

22

Next Steps

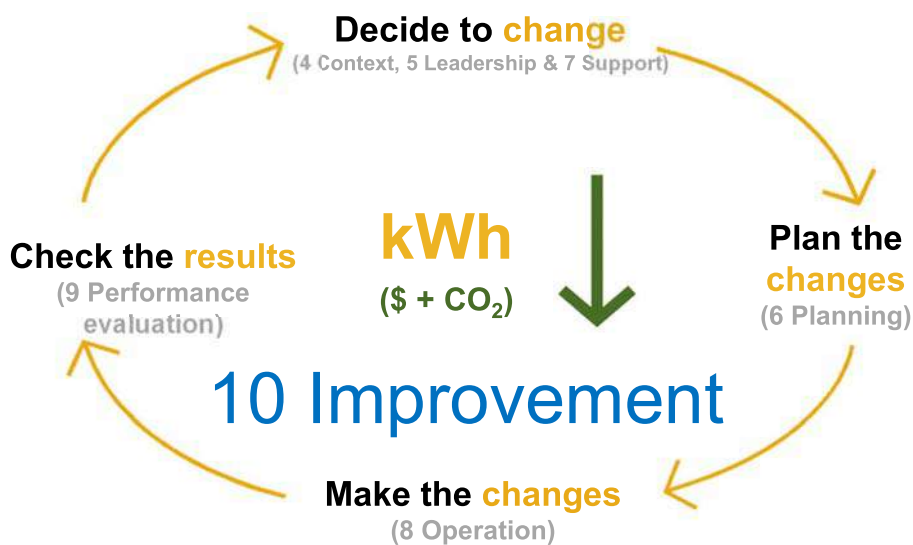
- Complete all open items in your EnMS
- Generate new ESOs
- Monitor your EnPIs
- Complete internal audits when you are ready
 - Consider auditing each other
- Schedule the management
- Use NCs for continual improvement
- Prepare for the final exam
 - Date
 - Location

23

Making connections

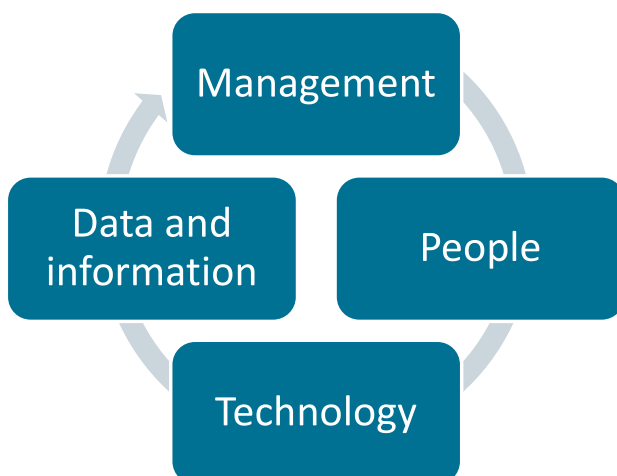
How all the EnMS parts fit together

24



25

Connections – Main components



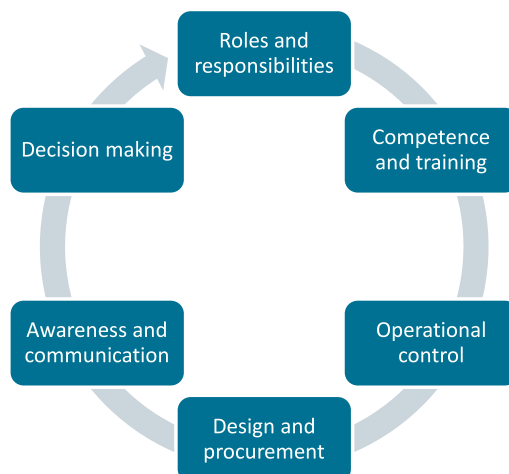
26

Connections - management



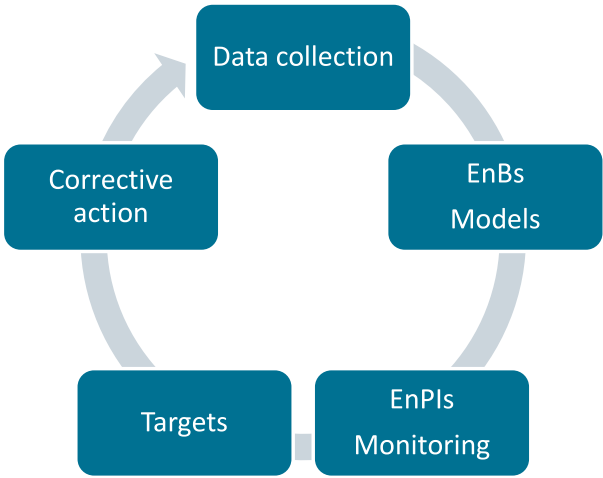
27

Connections - people



28

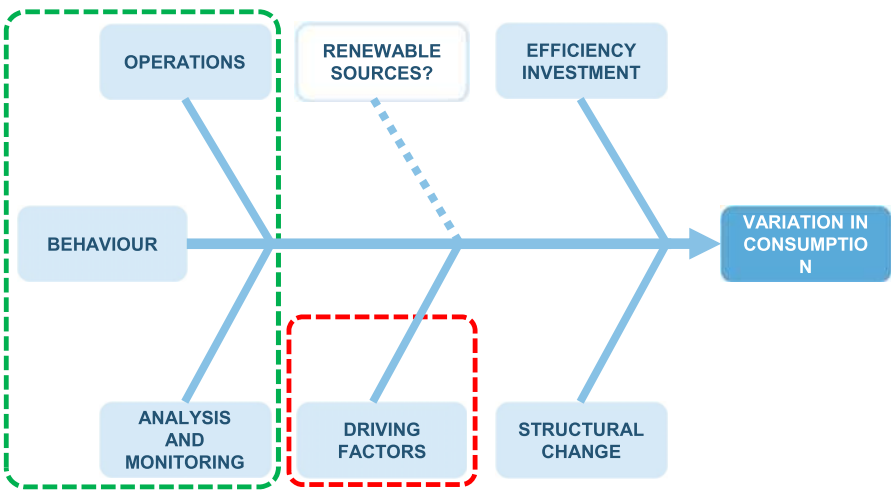
Connections - EnPIs



Connections - Technical



Connections – EnMS components



31

Enjoy the lunch!



32

REVIEWING & SUSTAINING THE SYSTEM

33

When do you make changes to the EnMS?

- Remember, it's all about energy performance!
 - SEUs
 - Energy data systems
 - Energy action plans
 - EnPIs
 - Objectives and targets

34

Review Significant Energy Uses

- Add to the identified significant energy uses over time, improving the efficiency and control of more equipment, systems, and processes.
- Major plant modifications, process changes or technology improvements to SEU no longer make it a priority
- Drivers have changed dramatically – production levels for a certain product have been reduced and the SEU's energy consumption is not significant.

35

Review Energy Data systems

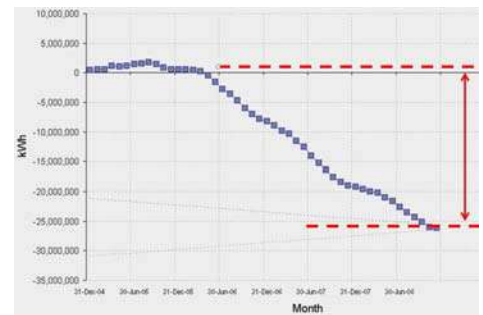
- Changes/additions to SEUs – require calibrated metering for monitoring
- Expanding scope - facility upgrades and additional utility meters
- New energy sources – CHP, renewables, fuel switching
- Current meters are no longer capable of measuring range



36

Review EnPIs

- Changes / additions to SEUs
- EnPIs no longer reflect energy use and consumption
- Changes to the energy baseline
- Major scope changes for facility-wide EnPIs



37

Review Energy Action Plans



- Not meeting targets
- Plans not getting done in a timely manner:
 - No resources
 - No capital
 - Unrealistic expectations
 - Discouraged energy team
- Project completion
- Annually – capital budget cycle?
- New objectives and targets

38

Review Objectives and Targets

- When old objectives and targets are met
- Change in top management sponsor
- New strategic plans
- Policy changes and long term goals change
- Resources for action plans are insufficient too meet objectives and targets
- Output from management review

39

Review & sustain the EnMS

The EnMS is a system which requires continual improvement to remain effective, improve performance and sustain energy savings.



“Continual improvement is an unending journey” Lloyd Dobyns

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LESSONS LEARNED

41

Expert Training Approach & Review

- 3 Training Sessions – Plan / Do / Check-Act
- Demonstrations – implementing EnMS in manufacturing plants
- Teaming plant and consultants
- Monthly Webinars
- Communication – LinkedIn & Windows Live



42

Flipchart Exercise

We will use a round-robin approach to capture the lessons learned so far in the Experts Demonstration.



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Day 3 End
Thank You

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DISCLAIMER

This document was developed within the framework of the project “Accelerating energy efficiency in large industries through energy management systems, system optimization and the promotion and adoption of energy efficiency in small and medium-sized enterprises (IEEP)”, funded by the European Union (EU), managed by the Ministry of Industry and Trade (MOIT), and implemented by the United Nations Industrial Development Organization (UNIDO). The content of this document is the sole responsibility of the Project and does not necessarily reflect the views of any individual or organization.