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HUMAN FACTORS AND ESCAPE OF SALMON FROM NORWEGIAN SEA-CAGE INSTALLATIONS

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Presentation of report

- Objective
- Method
- Results


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Rapportnummer - Fortrolig

Rapport

Menneskelige faktorer og rømming fra lakseoppdrettsanlegg

Årsaksanalyser med fokus på menneskets rolle

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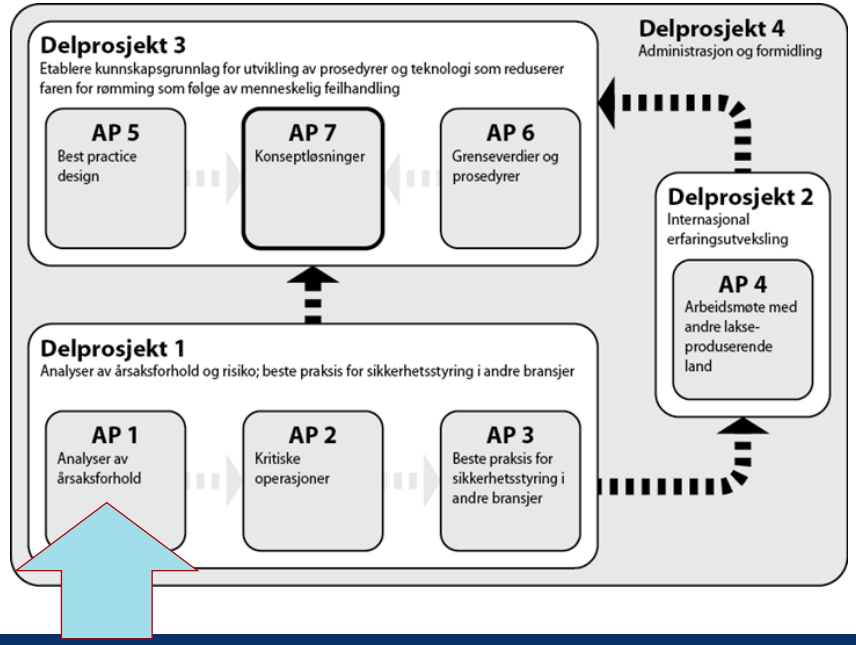
Objective

The projects objective is to establish research-based knowledge of human factors which can be related to escapes, in order to **develop solutions** that will help prevent and reduce escapes caused by "human errors" in the future.



Background

Mandatory certification + standard NS9415 – successful focus on technical aspects

Escapes with human factors

Norwegian 0-vision for escapes of fish from aquaculture installations (political interest – it is a crime)

Analysis of cause

"The accident happend because the rope was incorrectly fitted."

- Why did the person make a mistake? (contributing or underlying factors)
- What **measures** are taken to prevent escapes?

Method

- Interviews

Retrieve first-hand information from known accidents

- Reviews of non-conformity reports

Selection

1. Escapes**:** Installations that have rapported escapes to the Department of Fisheries in **2009-2012**
2. **Geography**: Different regions
3. **Size** of company: Large and small companies
4. **Construction:** (Plastic/Steel)

	Position	**Region**	**Construction/vessel**
1	Fish farmer	Sør-Trøndelag	Plastic cages
2	Operation manager	Sør-Trøndelag	Holding pen (steel)
3	Operation manager	Sør-Trøndelag	Holding pen (steel)
4	Production manager	All	Plastic and steel
5	Fish farmer	Nordland	Plastic cages
6	Management	All	Wellboat
7	Operation manager	Sør-Trøndelag	Steel
8	Matfisksjef	Nordland	Plastic cages
9	Operation manager	Møre og Romsdal	Servicevessel
10	Operation manager	Nord-Trøndelag	Servicevessel
11	Regionmanager	Hordaland	Plastic cages
12	Quality controler	All	Plastic and steel

Results

Results show that former escapes and near accidents can be linked to a combination of aspects, and identified causes include:

- Human-technology interaction
- The environmental impact
- Organizational aspects
- Human performance
- Economic considerations
- Cooperation, communication and management
- Training and experience
- Procedures, routines and management systems

"The accident happend because the rope was incorrectly fitted."

Human – technology

Sometimes technology can make it difficult to be human.

"As long as we have to touch the net it is a critical operation"

"Those who control the cranes use joystick or paddles, and will not notice if something is stuck"

DP3: Feedback, standardization, better affordance

The environmental impact

Several of the interviewed says that it is more demanding to work in bad weather or when it is dark. This in turn can lead to mistakes that would not have happened otherwise.

"We are pretty much always on the rings, also in the storm, but not if it is absolutely crazy - we were not out there during Dagmar (strong storm)"

"When it gets stressful and you are pressed for time it is not good. If in addition is dark, things can happen"

Organizational aspects

- Staffing and working hours
- Pressure from land
- Planning of operations
- Roles and responsibilities

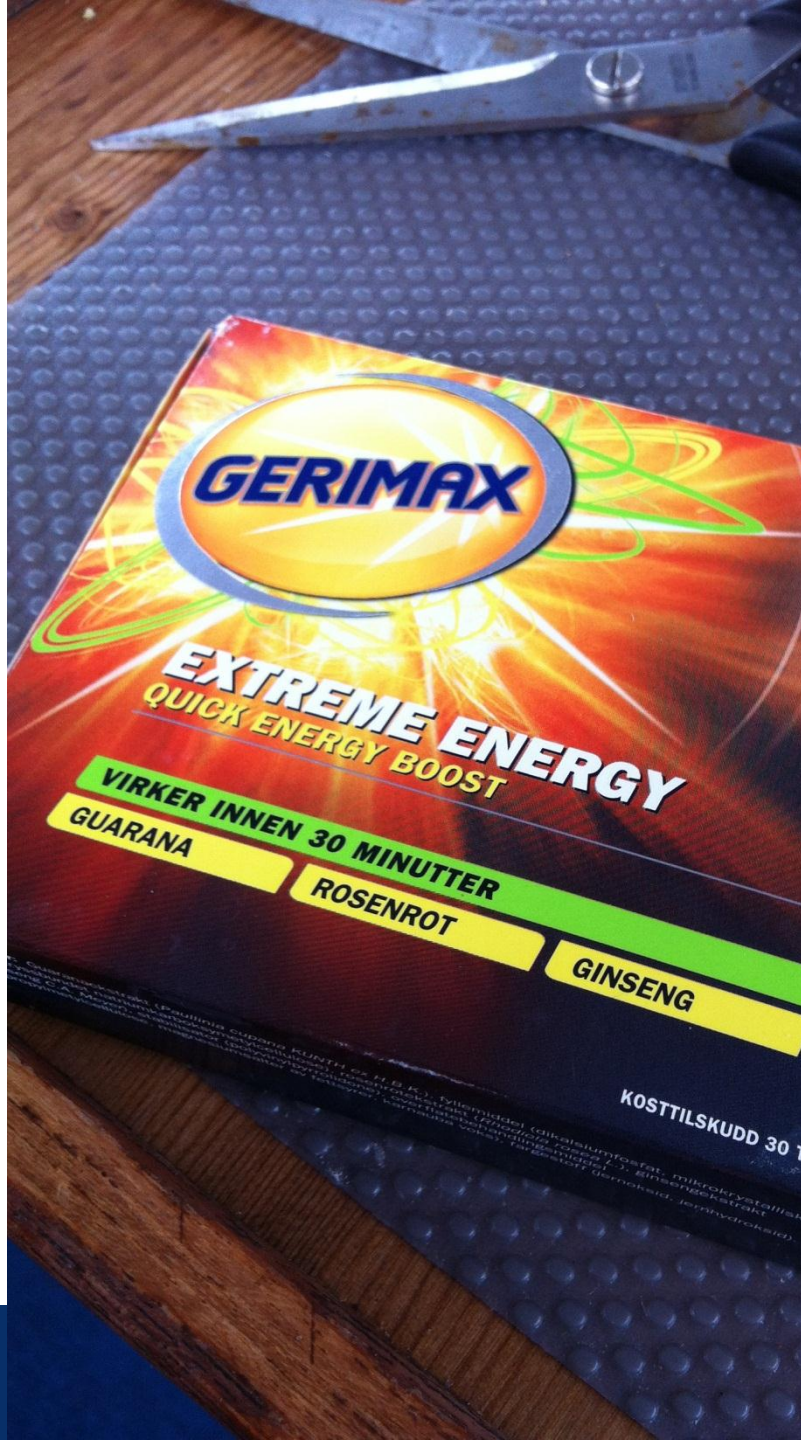
Human performance

Performance can be understood as both cognitive and physical, and is closely related to the employee in a given situation.

- The cognitive performance affect the ability to think clearly and have an overview of complex operations (vigilance), the ability to make quick decisions and perform the appropriate actions (reactions) and the ability to consider the consequences of their own and others' actions.

- The physical performance is about the individual's physical strength and endurance needed to perform occasionally heavy and lengthy operations.

" Whether or not people tell if they are tired will probably depends on each individual. If you feel there is a large system that relies on you, you will stretch yourself longer than usual "



Economic considerations

- Operations are often required to be conducted as quickly as possible to save costs.
- Some localities do not take in enough extra people when needed.
- Service boats or well boats are hired for a given number of days without the opportunity to be flexible.
- If the operation goal is set too ambitious it will result in stress and heavy workload for the staff - and can lead to long shifts due to understaffing

Cooperation, communication and management

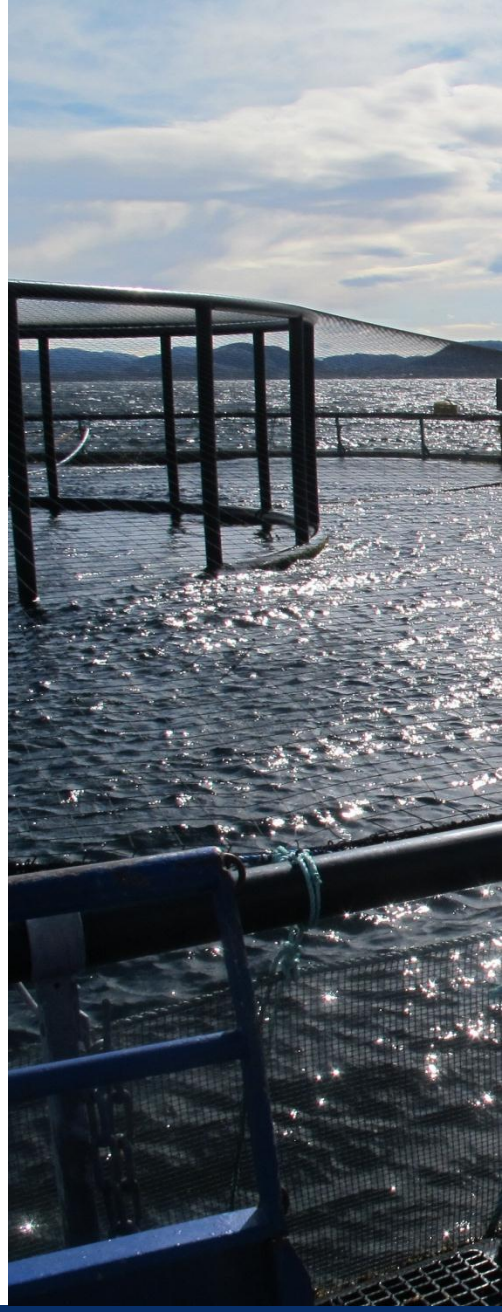
- Data from the interviews show that misunderstanding or lack of communication is seen as the cause of previous escapes events.

- A practical aspect of communication is the importance of good communications equipment, which contributes to that what is said is what is heard.

- Management emphasizes that they do not overrule the evaluations of the employees at the installations. This is reflected in the staff at the installations, indicating that management basically respect and understanding their assessments and decisions.

Training and experience

- Operations managers are very careful to whom they put to the tasks that are considered critical in terms of escapes.
- Examples of near-accidents shows that resourcefulness of staff have been crucial for escapes not to have occurred.
- That a fish farmer has experience with daily supervision and tasks done often, does not necessarily mean that the person has extensive experience in operations done rarely.
- Adequate training of temporary workers?



Procedures, routines and management systems

- Procedures exist, but they are not followed.
- There are no procedures.
- Inadequate risk assessments.
- Missing non-conformity reporting may lead to deviation not corrected and contribute or lead to escapes.

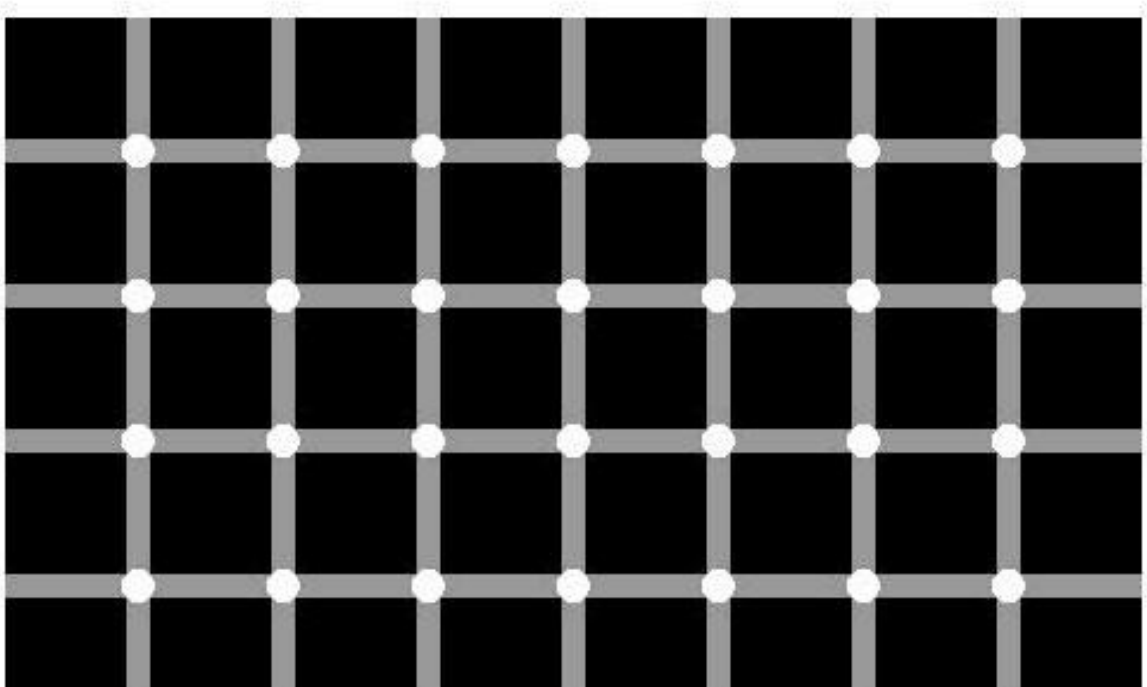
- Several points out that procedures and practices have been introduced or changed as a direct consequence of escape incidents at their or other localities.

No human factors?

The human factor will always be there

Acknowledge human errors: In 2003, the observers sat in the cockpit of Braathens in 3-5 hours .. Security must be robust enough to withstand it.

Robust saftey system, limiting and containing errors.



Examples of implemented measures

Supervision and inspection

- Inspection has been introduced as a direct action in the wake of escape incidents.
- Checklists for internal control sent electronically to operations managers each week and most be confirmed.
- Weekly check of nets with camera.
- Control by ROV or divers after the handling of nets or bottom ring.

Planning

- Make a work schedule showing sequences and how operations will be conducted.
- Meeting prior to major operation with a review of practices, procedures, risk assessments and job safety analyzes.
- Written agreements between service vessels/well boats and installations to avoid misunderstandings

Communication

- Operations Manager monthly meetings - forum for reflection and discussion
- The staff at the facility (in cooperation with externals) prepares procedure book for external stakeholders, such as service vessels, to ensure common practice
- The use of walkie-talkie or similar during operations, where also external teams can be connected.

Measures that can be done

- Introduce barriers and back-up saftey.
- Standardization of parts
- Look at possibilities to simplify complex operations (eg delousing with tarpaulin).
- Evaluate the Operational Manager's role in terms of workload and responsibility.
- Focus on the organization of work and employee performance (awareness at all levels of the company).
- Creating forums for dialogue between employees at facilities, service vessels and well boats.
- Use of simulator training, which includes land, construction and boat side.
- Greater focus on traceability in terms of technical maintenance.

Thank you.

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Report on: www.fhf.no "Menneskelige faktorer og rømming fra lakseoppdrettsanlegg"