



Regarding the status report on "Animal Welfare" Animal Welfare to Test Bed for large-scale land-based aquaculture step 2 (2021-01139) 2.

**Preplant AS
Owe Forsberg**

02	28,02,2022	Report delivery	QF	RQ
01	22.02.2022	Issued for comments	RQ	LM
Rev.	Date	Description	Issued by	Approved by

DOCUMENT TITLE

Scope of Work
Next Generation Digital Aquaculture Technology

DOCUMENT NO. P-11547-SOW-0001	REV. 00	PAGES 24	DATE 02.02.2022
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NR	Beskrivelse	Ansvar	Tid	
	<p>INTRO:</p> <p>A large-scale lamb-based aquaculture and test bed. In Sweden today there are many test beds of various kinds and in the EU and Norway as well. Today, there is no large-scale test bed where you can research large biomass, races, and multi-individuals at the same time. Today there are only 2 such in the world that are up to 1500 tons or more. Where you can in addition to test TRL 1-6 but also 6-9 and production equipment. One is in Poland and the other is in Norway.</p> <p>But in Test Bed for large-scale land-based aquaculture step 2, we will work up the different guidelines and the partners will within the group keep and implant the strictest rules for both the EU and Sweden in standards and health. Whether it is 10 or 1000 fish that will be researched.</p> <p>The project and the partners with Proplant AS have a large network of contacts in microbiology and fish farming and experience from the research environment in Norway and Europe as well as the commercial players in the brunch. This means that we will set up groups with a mix of people and, within the framework of the European guidelines, draw up the directives that will apply to the test bed when it is to be put into operation.</p> <p>During the project, we will also have study visits both in Poland and in Norway to go through how these large-scale fish facilities are run and their guidelines.</p>			

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<p>Overall:</p> <p>The aim of test bed phase 2 is to map and model a plan for how to establish an investment decision for «the world's most advanced test bed for sustainable, circular, land-based aquaculture. The test bed will contribute to development globally and is in great demand by the business community as aquaculture is responsible for a system change as it moves up on land more and more”.</p> <p>With these ambitions, of course, the framework conditions are crucial for success, including the conditions for research and testing of living biomass. In the current situation, there is a great focus on animal welfare in the aquaculture industry as this is somewhat less developed than other research on living biomass, some would argue. Sweden in relation to other countries such as Norway, Iceland, the Faroe Islands, Scotland, Ireland, Chile etc also does not have such a long and extensive experience in aquaculture research, especially on living things and living things in land-based facilities. Possibly at the basic research level, but at least not at a commercial level as the commercial activity in Sweden has not been significant.</p> <p>Common to all the various references Vinnova refers to regarding their two questions that are to be answered, there is a lack of research in the area, and there is a lack of close and close collaboration between authorities, researchers and the commercial business community. This is exactly what the test bed project aims to build the foundation for. Today there are few, if any, large test bed facilities in Sweden and thus the basis for this close collaboration has not been as natural, at least not</p> <p>Both as the Swedish Board of Agriculture addresses, together with SLU, other research, strategy challenges to the EU and not least the more populist scope of debate expressed in newspapers and magazines, one must put this on the map and ensure that one initiates closer and closer cooperation, especially with the commercial the stakeholders. To date, this has not been easy as the commercial activity has been almost absent, but with the planned land-based aquaculture facilities in</p>	
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Sweden both in fish farming, algae farming and soon also shellfish farming, there will soon be a more sustainable commercial scope that will create better conditions for a such cooperation as described above.

For the Test Bed project, we believe that the solution lies in 1) establishing a closer and closer collaboration with other countries' research and management in the area (the plan for a leading international test bed facility will almost require this), 2) establishing a comprehensive action plan with a strong public shock. This action plan should be part of a larger initiative. What, how, with whom must be clarified in the action plan, but both public authorities, research environments, commercial environments must be included.

Vinnova addresses and refers in particular to killing and slaughter.

The action plan must therefore include both research and assessment of the guidelines that a test bed must follow. These will probably be more extensive and somewhat different from commercial killing and slaughter in land-based facilities.

<p>What is fishing welfare.</p> <p>Welfare = health + «well-being»?</p> <p>Health:</p> <ul style="list-style-type: none"> • Mortality • Diseases and injuries • Growth- individuals and group <p>Well-being</p> <ul style="list-style-type: none"> • Feeding and feeding • Water quality • Opportunity for normal behaviour • Stress; fit stress of the right type 			
<p>Who will work with this?</p>			
<p>Construct a well-adapted environment around farmed fish in land-based facilities where Infection Control, Animal Health and Animal Welfare, establish common, validated, species-specific and verifiable indicators for fish welfare throughout the production chain (including transport and slaughter)</p> <p>our proposal is to recreate the environment in the pools which is a copy of fry places and are places that the parents come back to and the eggs are laid and the fry hatch plus a good water quality that is adapted to the fish.</p> <ul style="list-style-type: none"> - The environment around the fish, to produce an environment that has similar feedings that the fry will live in, in the places where they are born - Water that in the past was a good environment but is not today (we are in the field of nostalgia but right thinking about the welfare of fish.) <p>Plants in the water what adds to the plants the water and the plants.</p> <ul style="list-style-type: none"> - Bottom material, Rocks sand and other bottom material found in lakes, rivers, streams, seas. - our proposal is to recreate the environment in the pools which is a copy of fry places and are places that the parents come back to and the eggs are laid and the fry hatch plus a good water quality that is adapted to the fish. 			

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	<p>- The environment around the fish, to produce an environment that has similar feedings that the fry will live in, in the places where they are born</p> <p>- Water that in the past was a good environment but is not today (we are in the field of nostalgia but right thinking about the welfare of fish.)</p> <p>Plants in the water what adds to the plants the water and the plants.</p> <p>- Bottom material, Rocks sand and other bottom material found in lakes, rivers, streams, seas.</p> <p>- our proposal is to recreate the environment in the pools which is a copy of fry places and are places that the parents come back to and the eggs are laid and the fry hatch plus a good water quality that is adapted to the fish.</p>			
	Approach			
	<p>The overall objective of the proposed project is to develop comprehensive criteria to guide the assessment of Atlantic salmon welfare in land-based closed containment RAS operations and to ensure that fish welfare in the Swedish aquaculture project is maintained to a high standard.</p>			
	<p>We propose to approach this project in three phases, focusing on:</p> <ul style="list-style-type: none"> i) Pre-phase: evaluation of the RAS design and planned sensor technologies during facility construction in order to foresee possible welfare issues early in the planning. ii) Technology calibration/development, Documentation phase: monitoring stocked systems for fish performance, health and welfare, as well as other outcomes such as water quality and sensor performance; and iv) Assurance phase: personnel training in RAS operation and fish welfare assurance, as well as identification of a 3rd party certification group for ongoing facility and production evaluations. 			
	How do you ensure that the test bed has the skills to work with this?			

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	<p>Evaluations during the Pre-phase will include observation and assessment of RAS design and technologies in use at the AquaMaof Salmon R&D and Training Center near Warszawa, Poland.</p>			
	<p>During the Pre-phase and Documentation phase, specific knowledge gaps will be identified, and subsequent research projects will be proposed in order to address these gaps and inform subsequent RAS operations.</p>			
	<p>During all phases, the scope of assessment will be very broad and will include, but may not be limited to, the following components:</p>			
	<p>We know that a lot of research will be done on other species such as algae, mussels, and shellfish, etc. and guidelines will be drawn up for each group. But in this we used to take fish very slowly and describe salmon as a species. But the same lines of direction should bark if it is cod, catfish or something else.</p> <p>Files and design will be adapted to the species that will go through the system. The fish is calm, so it swims against the current and is kept calm and never stressed.</p> <p>It is equally important in a study and report to consider the environment around the test bed and infection control for naturally occurring animals and people who are to work in the facility or do research.</p> <p>It is important for aquaculture as well as for wild stocks of seafood. Risk of infection such as the introduction of animals and animal transports are carefully regulated, but the regulation of hygiene in the facilities can be improved. Regulations on animal welfare that take greater account of species-specific needs may need to be developed.</p> <p>There is also a need to promote and coordinate skills development, further training and dissemination of knowledge for aquaculture entrepreneurs, authorities, researchers and interest groups as well as other actors. When it comes to research and innovation, the focus is increasingly on application and utilization.</p> <p>The importance of interdisciplinary research and collaboration between different actors is also increasing. It is important to ensure that all needs are met, reduce a fragmentation of messages, and harmonize and streamline efforts that promote skills development, information dissemination and innovation.</p>			
	<p>NOTE: A</p> <p>Water quality standards to promote enhanced Atlantic salmon welfare, including:</p> <ul style="list-style-type: none"> • Dissolved oxygen 			

	<ul style="list-style-type: none"> • Carbon dioxide • Total gas pressure • Alkalinity • pH • Temperature • Salinity • Feed loading • Total ammonia nitrogen • Nitrite-nitrogen • Nitrate-nitrogen • Total suspended solids • Biochemical oxygen demand • UV transmittance • Water ozonation protocols (if utilized) 			
	<p>The pipsan is a modular sensor system for monitoring drinking water quality in pipes under pressure. It measures up to 10 parameters in one device :COD, TOC, DOC, UV254, Turbidity, Color, Chlorine, pH/Redox, Conductivity, Temperature and Pressure.</p> <p>The water quality data can be sent to any central database via almost any protocol. Multiple pipescans are the ideal solution to monitor drinking water at any point in the network.</p>			



Which parameters do you want to measure?
Find your analyser.

- BOD
- COD
- BTX
- TOC
- DOC
- UV254
- NO₃-N
- NO₂-N
- NH₄-N
- K+
- Free / Total Chlorine
- F-
- TSS
- Turbidity
- Colour
- pH
- ORP
- EC
- Temperature
- O₂
- O₃
- H₂S
- AOC
- Fingerprint
- Contaminant Alarm

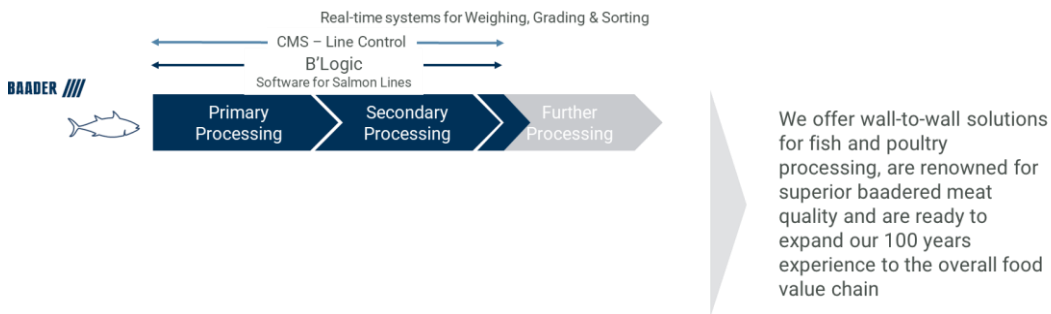
	<p>NOTE: B</p> <p>b. Other culture tank conditions, including:</p> <ul style="list-style-type: none"> • Stocking density • Swimming velocity • Light quality and photoperiod regimes 			
	<p>NOTE: C</p> <p>. Observable performance metrics, including:</p> <ul style="list-style-type: none"> • Growth • Mortality • Feed intake and conversion • Coefficient of variation • Fish health episodes 			
	<p>NOTE: D</p> <p>d. Observable welfare indicators, including:</p> <ul style="list-style-type: none"> • Condition factor • Fin erosion • Skin lesions • Cataracts • Opercular erosion • Musculoskeletal deformities • Behavior, including appetite, swimming patterns, energy levels, and aggression • Chronic stress physiology 			
	<p>NOTE: E</p> <p>e. Management and husbandry practices, including:</p> <ul style="list-style-type: none"> • Personnel training • Record keeping • Facility hygiene • Fish grading, handling, and movements • Tank and system hydraulic retention times • Feeding methods • Smoltification protocols (if utilized) • Vaccination protocols (if utilized) • Treatment protocols 			

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	<p>NOTE: F</p> <p>F. Humane slaughter methods Mapping of transmission routes in different aquaculture systems. Investigation of how the bacterial flora in the water affects animal welfare</p> <ul style="list-style-type: none"> • Development of routines that ensure that animals are placed in the, facility or bred on are health-controlled and healthy. • establishment of infection control barriers and routines to minimize the introduction of infectious agents into the facility. • Compilation of knowledge and experience regarding various measures that exist today and investigate appropriate measures in the event of disease outbreaks in various aquaculture systems. 		
	<p>life cycle. Finish slaughter Life cycle compass</p>		
	<p>We expect to recreate the environment around the fish so it can avoid being stressed, which means that it can be the fish that can end up swimming the last bit in peace and quiet.</p> <p>To give the fish natural challenges that are normal for the fish in their growth, in water and environment that is adapted to the fish's growth, then we reckon that it has been a life that you can say that it has created a very calm fish that now at the end should be anesthetized and which swims calmly into the anaesthesia machine and it can also be inserted manually.</p>		
	<p>Implementation of technical and digital solutions as well as methods that documented shows improved animal welfare</p> <p>A digitalized food value chain will allow food companies to identify and react to market opportunities with speed and confidence, quickly develop innovative products and launch them flawlessly, reduce plant commissioning and change overtimes to drive productivity, marshal the entire value chain network and food supply chain to rapidly capitalize on new opportunities, leverage information to continuously improve products and production performance.</p>		

We believe that digitalization helps to take full advantage of automation, to seamlessly manage quality, track production execution thereby creating transparency and traceability.

How does the industry do today! what is most gentle and what can we take with us into the test bed project gets big salad production



Fish Processing



10 BAADER Corporate Presentation Q2 2021

How to increase resource efficiency with the best possible quality outcome

Deliverable

The end product of this assessment will be a document summarizing a comprehensive range of welfare standards for Atlantic salmon production to market size in land-based, closed containment RAS operations. The initial establishment of these welfare standards will be based on published and unpublished research and production data, interviewing RAS operators, and expert opinion, among other approaches; however, the intention will be to create a living

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	<p>document that is designed to be regularly updated based on ongoing production data and experience, and that ultimately an adaptive management approach will be applied to Atlantic salmon welfare standards in RAS.</p> <p>Assurance will be addressed through the identification of a qualified 3rd party certification group for regular ongoing evaluations.</p> <p>differentiator in digital business across virtually all business functions, such projects need to connect and involve many people as well. What therefore becomes essential is collaboration.</p> <p>Digitalization is breaking down traditional boundaries and supporting the reorganization of work into open ecosystems to enable greater collaboration. As literally everything gets connected and integrated, collaboration, engagement, education and even buy-in of involved people and teams become the success factor.</p> <p>We aim to apply our digital capabilities in ways they enhance both the cognitive and collaborative side of work as well as the physical possibilities of human beings.</p>			
	<p>RAS system that deliver a good health and welfare of animals and fish, for the benefit of the animals and consumers. Safe food, as a contribution to the protection of public health</p> <p>Documentation of fish welfare in the development of aquaculture technology</p>			
	<p>Development of new forms of production that ensure the animal's welfare and health as well as infection control</p>			
	<p>Mapping of welfare, experience, and conclusion? When we define test-bedded projects and what is to be built and developed for the Swedish market and experiences from pilot projects with the Test-bed structure, you have to ask yourself and look at ..</p> <p>All data must be analysed with care if one is to say anything about differences in such large-scale test setups, build datasets based on individual registrations, connect lice, growth and welfare</p> <p>☑Results and assessments must be communicated along the way to help adjust the layout</p>			

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<p>☑ Should be a goal to get a standardization of methods of registration - to be able to compare biology and welfare in different technology solutions. Must take into account fish welfare when handling</p> <p>☑ Primary stress: plasma cortisol methodology works well, can help to identify critical phases</p> <p>☑ Secondary stress (metabolic): Can be measured through oxygen consumption / respiratory rate - possible also to use other tests - could provide valuable extra information?</p> <p>☑ Mortality and causes of death - important information but can also be resource intensive if data is to be good</p> <p>Growth: it can be difficult to describe this well enough along the way UsetLice numbers: all plants have regular counts, but counts in closed cages necessitated stricter infection hygiene</p> <p>☑ Water quality: basically easy, but resource-intensive to get good and comparable measurement series (sensors, location, calibration, maintenance, etc.) of all factors that are important for the fish</p> <p>☑ Feed and quality of feeding routines - very important, but experience shows that practical problems can arise along the way that can disrupt or even destroy the possibility of comparison between units</p> <p>☑ Behavior: MUST BE INCLUDED! Provides summary and absolutely necessary information about how the fish are doing!!!</p>			
<p>Overall overview of the status of the new regulations</p> <p>Ongoing regulatory processes for the various regulations can be found further down the page under the section «Regulations under development». The table below briefly summarizes the status of the various regulations and provides a link to the regulations that have been established. Regulations Contents Status Link to Lov data Animal Health Regulations</p> <p>Implements the Animal Health Regulation (EU) 2016/429, supplementary regulations related to Part I of the AHL and national regulations.</p>			

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	<p>Consultation 1 (implementation of regulations) closed. Animal Health Monitoring Regulations Implements supplementary regulations related to Part II of the AHL and national regulations.</p> <p>Consultation 1 (implementation of regulations) closed.</p> <p>Animal Disease Control Regulations Implements supplementary regulations related to Part III of the AHL and national regulations.</p>			
	<p>Consultation 1 (implementation of regulations) closed. Land animal traceability regulations</p> <p>Implements supplementary regulations on registration and approval of facilities, as well as traceability of terrestrial animals related to Part IV Section 1 of the AHL and national regulations. Consultation 1 (implementation of regulations) closed.</p> <p>The Breeding Materials Regulations Implement supplementary regulations on breeding material related to Part IV, Section 1 of the AHL and national regulations. Consultation 1 (implementation of regulations) closed. Consultation 2 (national regulations) closed. Land animal relocation regulations</p> <p>Implements supplementary regulations on transfers of terrestrial animals and animal products from terrestrial animals in the EEA related to Part IV Section 1 of the AHL and national regulations. Consultation 1 (implementation of regulations) closed.</p> <p>The Aquaculture Regulations Implement supplementary regulations related to Part IV, Section 2 of the AHL and national regulations. Consultation 1 (implementation of regulations) closed.</p> <p>The Animal Import Regulations Implement supplementary regulations related to Part V of the AHL and national regulations. Consultation 1 (implementation of regulations) closed.</p> <p>Animal Disease Emergency Regulations Implements temporary legislation with specific control or emergency measures against specific diseases (ASF, CSF, HPAI, Bsal and LSD) Implemented following simplified procedure without consultation. Established</p>			

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	<p>Regulations on temporary control and emergency measures to prevent the spread of specified animal diseases in the EEA (Animal Disease Emergency Measures Regulations) The Land Animal Health Certificate Regulation</p> <p>Implements health certificates with animal health requirements that must accompany terrestrial animals and breeding material from terrestrial animals during transfers within the EEA and imports from third countries. Food Health Certificate Regulation</p> <p>Implements health certificates with animal health requirements that must accompany animal products from terrestrial animals during transfers within the EEA and imports from third countries</p> <p>The Aquaculture Health Certificate Regulation Implements health certificates with animal health requirements that must accompany all stages of life of aquatic animals and animal products from aquatic animals during intra-EEA transfers and imports from third countries.</p> <p>All used materials at food contact zones are made of stainless steel with a min. quality of 1.4301/ AISI 304 or food-grade plastics suitable for wet products</p>			
	comparison between different ways			
	<p>we will make a comparison with odlings Meder i skjö = ordinary fishing? and aquaculture on land to look at health</p> <ul style="list-style-type: none"> • Stress during various operations • And Definition of stress for fish Blood chemistry (cortisol, pH, lactate, Cl-, etc) (acute and chronic stress) ☑Muscle activity (acute escape response, pH in white muscle) Stress can be related to issues related to fish welfare (disease, mortality, abnormal behavior...) Handling stress stress level after several unit operations sea <p>Problems in cages today ? Not normal swimming behavior in kar / mära ? Eventually ulceration and fungal infection ? Vaccination</p>			

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	Implementation			
	<ul style="list-style-type: none"> • Standardized basic and further education for aquaculture users, with a focus on: • Standardization, planning and follow-up of the regulatory requirements regarding training and experience of aquaculture personnel as described in the Swedish Board of Agriculture's regulations • Investigation of standardization of "relevant theoretical training in fish farming technology", which is required by the responsible person according to the Swedish Board of Agriculture's regulations • Investigation of the need for follow-up and further education with regular periodicity • Investigation of training needs of and requirements for supervisory officers • Planning and design of basic education and training in fish farming technology, fish health, fish biology and infection control • Investigation of amendments to the "Swedish Board of Agriculture's regulations on fish farming" for the introduction of requirements for a nationally coordinated education that provides certificates, requirements for continuing education at regular intervals and validation of professional experience. • Competence-building initiatives through continued support and further development of existing educations as well as development of new ones at all different levels • Collaboration and competence building with the surrounding community aimed at schools, public kitchens, restaurants, the media and the general public • Innovation-enhancing initiatives, proposed idea generation, inventory of new business ideas, incubator, and start-up processes, as well as active facilitation, process management and coaching, and more • Exchange of experience and target group-adapted networking, both nationally and internationally • Coordination of activities, for example through networking platforms, coordination, and national dissemination of training, as well as support for continued operation 			

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	MICROORGANISMS, ALSO CALLED MICROBES,			
	<p>Chemicals or gas do we mean that the use of nitrogen or carbon monoxide affects the welfare of the fish and carbon monoxide appears as an animal welfare acceptable and practically useful method, how can the work environment risks with this gas be mastered for the workers or If euginol and isoeuginol induce unconsciousness in the fish?</p> <p>In aquaculture, we believe that as few chemicals as possible should be used due to the environmental, food safety and work environment risks for those who work in the plant. Substitution study must be carried out in the facility.</p> <p>Doing electricity induces unconsciousness in fish or only immobilizes the fish.</p> <p>When the fish is calm, it swims against the current and at the end of the pool there are stunning masks that the fish slide into and are stunned and killed at the same time, this is something we will further develop and refine.</p> <p>When the fish walk in this environment and the water, it has achieved a calm that makes it possible to handle the fish anywhere during its life cycle. It may be for sampling or killing if necessary</p>			
	<p>Substitution: How to replace hazardous chemicals in all business</p> <p>Chemical substances and products are an important part of the daily working environment in many Norwegian workplaces. Several of these can pose a great risk to both health and the environment. By replacing hazardous substances and products with less harmful alternatives, we reduce risk. here we see MICROORGANISMS, ALSO CALLED MICROBES have great potential. At the same time, we ensure that we live up to the regulations and create a safer working environment.</p> <p>This is what the legislation says about the substitution of chemicals</p> <p>Substitution is required by law for all companies that professionally use products that contain chemicals that are harmful to health and the environment - often referred to as a substitution obligation. Hazardous chemicals should not be used if they can be replaced by a chemical substance or a less dangerous process. The requirement for substitution applies to chemicals where there is a risk of cancer, genetic damage, reproductive damage and allergies.</p>			

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	<p>We have a duty to provide you with knowledge about which chemicals can pose a danger and assess the risk to health and the environment.</p> <p>According to the Product Control Act §3a, we are required to assess whether the products you use, which contain hazardous chemicals, can be replaced with less hazardous alternatives.</p> <p>We will also consider whether it may be possible to choose another working method where the use of hazardous chemicals can be avoided. If we are unable to replace the harmful substance, you can take some technical measures, such as extraction, to try to minimize the effect of exposure. and use microbes instead</p> <p>If we cannot eliminate or limit employees' exposure to the substance, you must provide appropriate personal protective equipment, such as protective gloves and suits.</p> <p>Note that the law allows for an exception if it can be documented that substitution can lead to unreasonable cost or inconvenience.</p> <p>The image below outlines the prioritization of actions when your goal is to create a safer work environment. If you can eliminate the use of a substance or a chemical substance, it is the safest. Then substitution is the safest way to replace a substance or materials with a less harmful substance.</p>			
	<p>Substitution has many benefits beyond reducing the risk of harm to animals, humans and the environment "the general footprint". We can reduce the need for safety measures and special routines in connection with production, use, waste management and transport!</p>			
	<p>Better working environment</p> <p>The less our employees or colleagues are exposed to harmful substances, the better and safer a working environment will be. It also means that you will experience fewer work injuries and sick days when employees are not exposed to the dangerous substances.</p> <p>Better competitiveness</p> <p>our business and our products immediately become more attractive in a market that constantly demands products and processes that are not harmful to either people or the environment.</p>			

A sustainable imprint

Substitution also reflects a general effort to make your business more sustainable, especially in relation to a circular economy, as it is easier to recycle and reuse products and materials that do not contain harmful substances.

Save money on security

There is also a large financial incentive to replace dangerous substances. With less harmful alternatives, risk is reduced, and you gain greater control in the workplace. Thus, less time and resources must be spent on managing the risks associated with the use. Substitution also reduces the need for a number of safety measures, such as personal protective equipment and routines related to production, use, waste management and transport.

How to succeed with substitution of hazardous chemicals

Finding alternatives to known work processes, materials and products can be a resource-intensive process. Therefore, we recommend that you constantly look at the possibility of substituting so that your business is ahead of the law.

Remember that the process must be documented!

As a company, you must investigate whether you can make substitutions by describing the technical requirements that must be placed on the substance or material to replace the substance, material or work process. You can contact suppliers and ask if they can supply less harmful products that meet your requirements.

If after the process you conclude that it is not possible to make a replacement, this must be documented. The documentation can be the requirements specification and a statement from the supplier that a less harmful substance cannot be delivered.

But how do you handle the practical substitution process so that we work according to a "better precautionary" principle?

Below you will find a 7-step plan that we recommend when you plan to replace hazardous substances with Microbes or more environmentally friendly products

Step 1: Make an overview

Start with a systematic review of all the chemicals found in the business. If you have already carried out a thorough risk assessment, much of the work has already been

done. It will give you a quick overview of the company's most dangerous substances and products.

Make sure you have a thorough knowledge of the chemicals used in the business. As hazardous properties and what function they have in a possible mixture, product or process. It is important that you consider all the hazards and risks associated with the chemicals in each part of the product life cycle. In this way, substitution on the wrong basis is avoided, for example by using substances of very high concern (SVHC).

Once you have an overview, it can be useful to ask the following questions:

- Does the product have properties that can harm health or the environment?
- Will people or the environment be exposed to the product?

You can get an answer to this from the person who produces, imports or sells the product. See first and foremost in the safety data sheet or equivalent documentation. In addition, the occupational health service can be a useful resource.

Step 2: Identify the risk

When you have sufficient information about the product's health and environmental hazardous properties, the exposure must be identified. How likely is it that:

- a) use of the product implies a high probability of exposure
- b) humans and animals as well as the environment may be affected:

- in the workplace
- via emissions to air or water
- via the product
- via the waste when the product ends up in a landfill or incinerated

- c) that other risk situations for people and the environment may arise when using the product

It is important to assess the degree of hazardous properties against the likelihood that this may result in damage to health and the environment. A product with very dangerous properties poses a great risk to health and the environment even in small quantities, while a less dangerous product can also pose a great risk if used in large quantities.

Step 3: Prioritize

The information from steps 1 and 2 will reveal which products you should consider replacing or finding a good alternative to.

Priority should also include substances that you believe are not necessary for a product or process to work. You should also consider whether certain substances will be subject to regulatory action in the near future.

Good aids in the work of prioritizing the properties of the chemical, the authorities' list of priority environmental toxins and ECHA's candidate list.

The candidate list contains substances that give great cause for concern for health and / or the environment (SVHC). Substances on this list are candidates for further regulation under REACH. There is a duty to provide information when selling and using a substance on the candidate list. In other words, the candidate list is your best tool for the future of your business. If there are substances on this list that are included in the production or sale of your goods, you should consider substitution as soon as possible.

Include the entire supply chain

You can benefit from informing both suppliers and customers about your work with substitution. They may have special requirements that you must meet at this time, or in the near future. They may even have ideas for better and safer alternatives.

Learn how Chemical Manager can help you create an overview of your substances and materials.

Step 4: Map out options

You have now identified the potential risk associated with a product you are using or plan to use and prioritized what to address.

Relevant questions will be:

Can the product be replaced at the same time as its intended function is taken care of without unreasonable cost or inconvenience?

Can the content of the hazardous component be reduced so that the risk is reduced?

Is it possible to reduce the use or stop using the product?

Can the method of production or use be changed?

One should initially consider whether there are alternatives that offer lower risk. One measure may also be to change the work process so as to achieve reduced use of or exposure to the hazardous chemical.

But also remember that you should always consider energy and resource consumption, waste, recycling, and social consequences

Feel free to seek advice from others, such as suppliers, industry associations or others. Ask about the products' health and environmental hazardous properties, and how these should be handled.

Step 5: Compare risks

Comparing risks is not always easy. This may be due to insufficient information about one of the products or that one compares the risk of an environmentally hazardous substance with a hazardous substance.

It is important to get as comprehensive an assessment of risk as possible. You must do your best to have enough knowledge that the alternative poses a lesser risk to health and the environment. It is not right to replace a product with known risk with an alternative you lack knowledge about.


In order to acquire sufficient knowledge of the alternatives, the following questions may be useful to ask:

- Is the alternative more dangerous or less dangerous with intentional use?
- Will any of the products or methods pose a greater risk to humans and the environment than the others?
- For which of the products is it easiest to limit risk? For example, for measures such as:
 - use of protective equipment
 - isolation of the process
 - collection and delivery of residual product / waste to an approved reception

Step 6: Substitute?

After following all the other steps, at this stage you will probably be left with a product that entails less danger to health and the environment, and substitution can be carried out.

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	<p>However, the alternative product shall not entail an unreasonable cost or inconvenience to the business. Note that health or environmental benefits over the life of the product can often compensate for a high additional cost in the short term. If the health or environmental benefits can be estimated to be greater than or equal to the costs, substitution must be made.</p> <p>Factors such as:</p> <ul style="list-style-type: none"> reduced risk of harm to people and the environment reduced need for safety measures (protection measures) and special routines in connection with production, storage, use, waste management and transport reduced amount of hazardous waste, and thus reduction in expenses for waste management <p>Step 7: Inform all links in your value chain</p> <p>Remember to inform your customers and suppliers about your compensation, as the changes may very well affect their work, and they also can inform their stakeholders.</p> <p>One suggestion would be to publish a news item about your substitution. In this way, you not only cover the information needs of your stakeholders, it can also give you a competitive advantage over your competitors, as your business will be seen as more responsible.</p>			
	<p>Through both national laws, such as the Product Control Act and the Working Environment Act, as well as in the European Chemicals Regulations REACH, you will find requirements for substitution.</p>			
	<p>MVH</p> <p>Owe Forsberg</p> 			

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