

Sensoren T-Shore Sensors

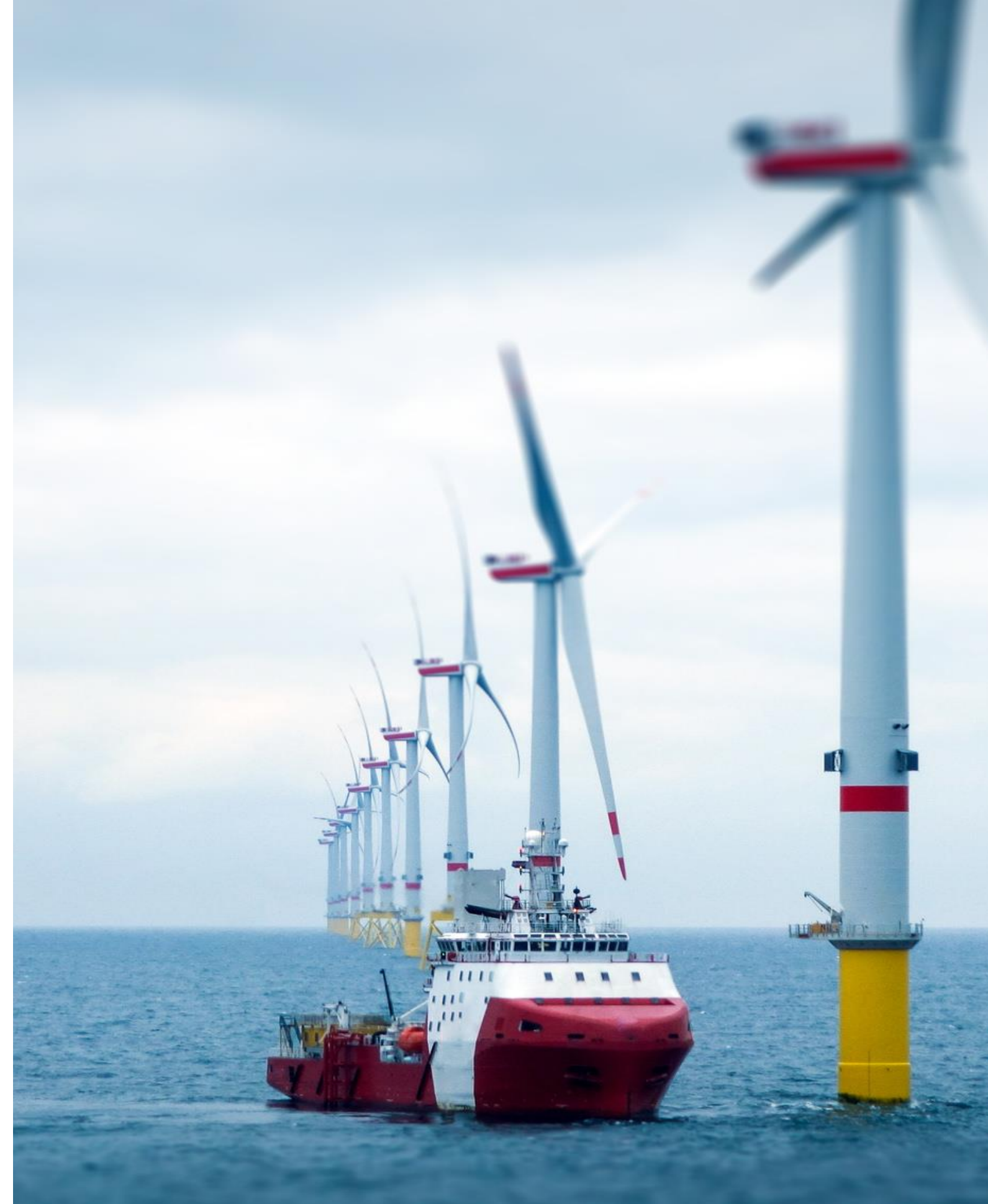
Elective course 'Maintenance of wind turbines' K1312

3 lessons of 4 hours on sensors

Lesson 1: Acquire general knowledge about the function and operation of sensors

Lesson 2: Acquiring skills and learning in practice

Lesson 3: Carry out an integral assignment



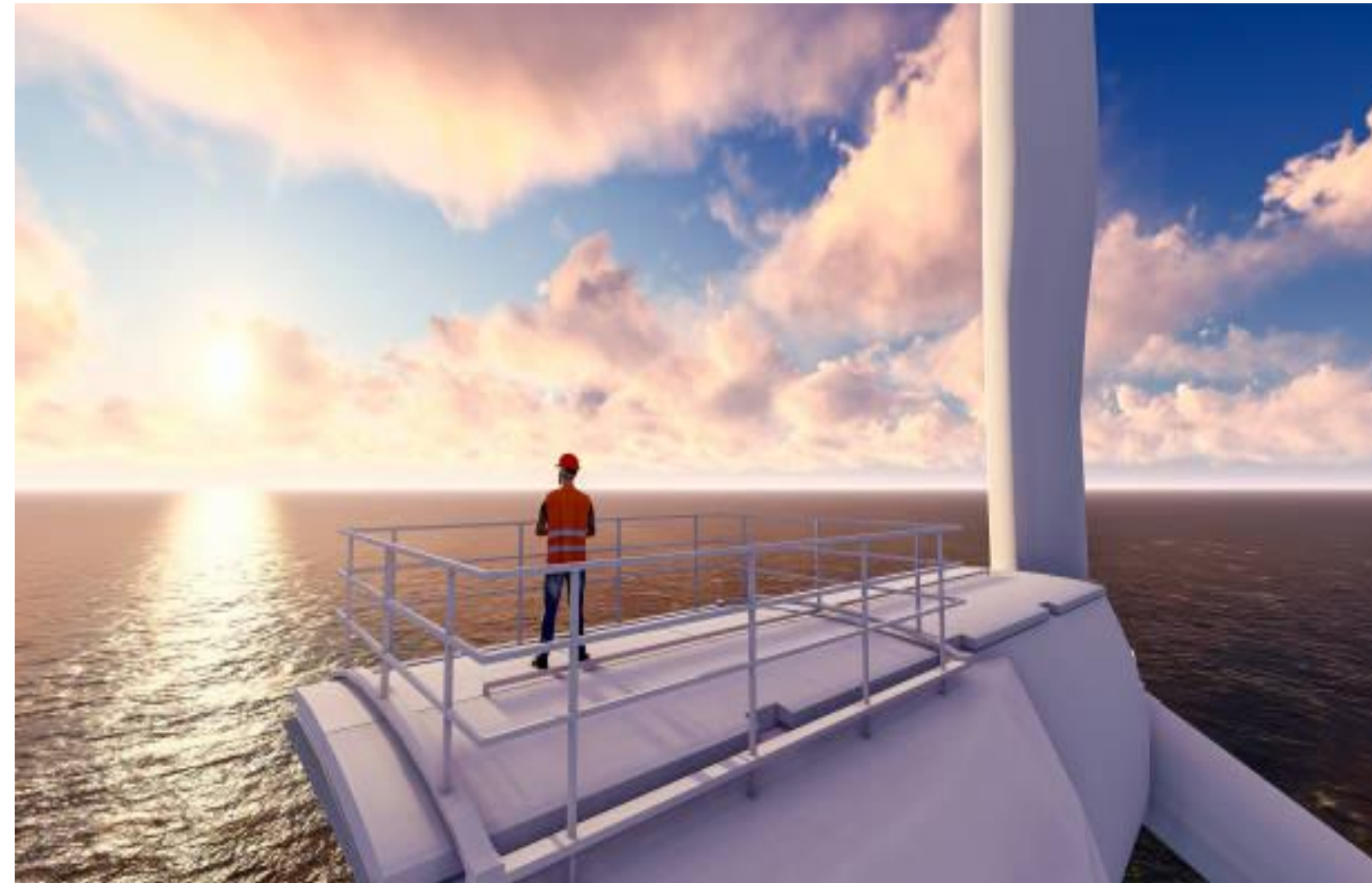
Agenda lesson 1

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|-------------------------------------|--------|
| 1. Agenda and lesson goal | 5 min |
| 2. Retrieve prior knowledge | 10 min |
| | |
| 1. Instruction sensors general | 15 min |
| 2. Assignment A and B | 30 min |
| | |
| 3. Pause | 15 min |
| | |
| 4. Instruction wind turbine sensors | 15 min |
| 5. Assignment C | 60 min |
| | |
| 6. Safety instruction | 15 min |
| 7. Assignment safety | 30 min |
| | |
| 8. Completion and preview | 30 min |



Lesson objective

1. After the lesson, you will know what sensors are and how they work
2. After the lesson, you can give examples of sensors



Retrieve prior knowledge (10 min)

Possible questions:

- What do we already know about the subject?
- What did we see in the video (beforehand)?
- What do you encounter during your internship? At work, at home, in this room?
- What do you have questions about, what would you like to learn?
- What do you need for your exam?



General theory sensors 1 (15 min)

A device or component that converts physical quantities into a signal that can be detected and processed by a system.

It is an artificial implementation of what is called a sense organ (eye, hearing, vestibular system, touch, taste, smell) in biology.

With a sensor, one can perceive information from the environment. A sensor registers changes in the environment.

The sensor converts a measured physical quantity into an electrical signal (current) so that it can be analyzed by other systems



General theorie 2

Examples of sensors:

- Temperature sensor
- Pressure sensor
- Motion sensor
- Light sensor
- Accelerometer

Sensors can be divided into **two main groups** ;

- The Binary (0 or 1), the Analog (all values)

Question: What causes the mercury to rise in a thermometer?



Assignment A and B (30 min)

Assignment A (work in pairs)

1. Name at least 5 sensors that you can find in a home or here at school
2. A mercury thermometer is a good example of a simple form of sensor. Explain the principle of this sensor. Which physical processes take place, in other words, how does this system work? Use source information on the internet for this. Is this an analog or binary sensor? Please explain.



Assignment A continued

3. Your iPhone is in the sun. It has become so hot that it switches off. Only when it has cooled down can it be turned on again. Explain how this can be done.
4. Make a drawing/sketch of how the principle of a sensor works. How a sensor senses a physical change and translates this into a signal. Use source information or the internet for this.



Assignment B

At the end of these assignments, the findings are shared with each other and an explanation is given of everyone's product



Theory wind turbine sensors (15 min)

The sensors in a wind turbine help to monitor, optimize efficiency and ensure safety.

- Wind direction sensor (anemometer)
- Wind speed sensor
- Vibration sensors
- Temperature sensors
- Speed sensor / over speed sensor
- Voltage and current sensors
- Position sensors
- Level sensor



Assignment C (60 min)

1. Indicate in this sketch/longitudinal cross-section of the wind turbine where which sensors are located
2. Analyze a wind direction sensor and map the route of the signal. In other words, draw and sketch the operation of a sensor
3. Now analyze a temperature sensor in the same way
4. Now analyze a pressure sensor in the same way
5. Make it clear in the sketch how the physical signal is created, how it is converted into an electrical signal and which route this signal takes to the display of the monitor.

Look up this background information in the available source documents or on the internet.

At the end of this assignment, the various findings are shared with each other.



Example drawing assignment C



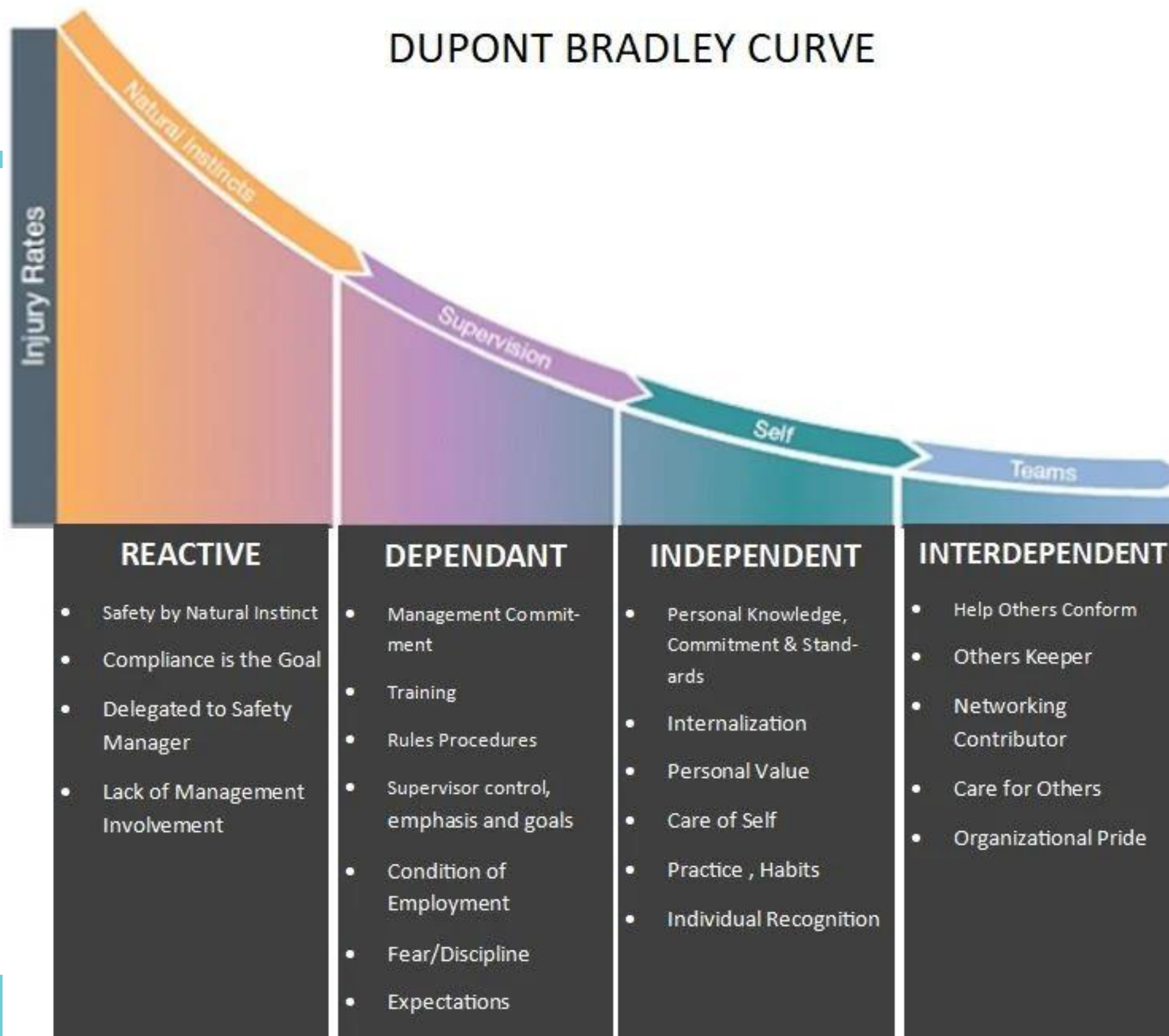
Safety theory (15 min)

Lesson block 2 is all about practice and practicing/working on the simulator.

In preparation for this, a general safety check and exercise will be carried out.



DUPONT BRADLEY CURVE



T-shore

Importance of Approved Working Practices

- Safety First
- Doing it Right
- Consistency
- Building a Safety Culture
- Regular Training and Updates



Safety data sheets

Material Safety Data Sheets (SDS)

(g) Safety Data Sheet Format



- 1. Identification of the substance or mixture and of the supplier**
- 2. Hazards identification**
- 3. Composition/information on ingredients**
- 4. First-aid measures**
- 5. Fire-fighting measures**
- 6. Accidental release measures**
- 7. Handling and storage**
- 8. Exposure controls/personal protection**
- 9. Physical and chemical properties**
- 10. Stability and reactivity**
- 11. Toxicological information**
- 12. Ecological information (non-mandatory)*
- 13. Disposal considerations (non-mandatory)*
- 14. Transport information (non-mandatory)*
- 15. Regulatory information (non-mandatory)*
- 16. Other information, including date of preparation or last revision**

Safety signs



Wear ear protectors



**Fire escape
keep clear**



**Protective footwear
must be worn**



**Eye protection
must be worn**



Wear gloves



**All visitors and
drivers must report
to reception**



PPE when working with mechanics

Main mechanical PPE equipment:

- Head Protection (Helmets)
- Eye and Face Protection (Safety Glasses and Shields)
- Hearing Protection (Earplugs or Earmuffs)
- Hand Protection (Gloves)
- Foot Protection (Safety Shoes)
- Respiratory Protection (Masks or Respirators)
- Body Protection (Work Clothing and Aprons)
- Fall Protection (Harnesses and Lanyards)



Personal Protective Equipment (PPE) is essential in providing a barrier between the worker and hazards in the mechanical work environment

Lockout-tagout procedure



The importance of appropriate isolation

The importance of emergency stop buttons... why are they there and when should they be used?

- Impact of e-stop on mechanical systems (video)



Safety assignment (30 min)

Assignment D. Work in pairs again

1. Start by going through and practicing all safety regulations as they apply to the wind turbine
2. What safety attributes do you need? Work this out in a checklist
3. What risks can I face if I do not comply with the safety regulations? Name these
4. Discuss in classroom



Test yourself Kahoot

Link to questionnaire



Conclusion, evaluation and preview (30 min)

- **How did the exercises go?**
- **Short repetition of important theory**
- **Has the lesson objective been achieved?**
- **How did the lesson go?**
- **Preview next lesson and exam**

