Augmented and Cross Reality for Sustainability: Empowering Field Workers and Reducing Carbon Emissions

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Chapter 1: Introduction to Augmented and Cross Reality

Augmented reality (AR) and cross reality (XR) are revolutionary technologies that merge the physical and digital worlds, offering immersive experiences and real-time information overlay.

1.1 Definition of Augmented Reality (AR) and Cross Reality (XR)

Augmented reality (AR) is a technology that superimposes digital content, such as images, videos, and 3D models, onto the real-world environment, enhancing our perception and interaction with the physical world. AR enriches our sensory experience by providing real-time information and virtual elements that blend seamlessly with our surroundings. Cross reality (XR) encompasses a broader spectrum that includes AR, virtual reality (VR), and mixed reality (MR), providing varying levels of immersion and interaction between the real and virtual worlds.

1.2 Applications and Benefits of AR and XR

The applications of AR and XR span across numerous industries and sectors. In the entertainment and gaming industry, AR and XR create captivating experiences, allowing users to interact with virtual characters and objects in their real surroundings. In healthcare, AR and XR assist in medical training, surgical planning, and patient care, offering enhanced visualization and simulations. Education benefits from AR and XR by providing interactive learning experiences and virtual field trips, making education more engaging and immersive.

Other industries, such as manufacturing, architecture, retail, and logistics, also leverage AR and XR technologies. These technologies enable product visualization, design prototyping, remote collaboration, and efficient inventory management.

By overlaying digital information onto physical spaces and objects, AR and XR enhance productivity, efficiency, and decision-making processes.

1.3 Introduction to the Concept of Sustainability and its Importance

Sustainability is the practice of meeting the needs of the present generation without compromising the ability of future generations to meet their own needs. It encompasses environmental, social, and economic considerations. With the increasing global focus on mitigating climate change, reducing carbon emissions, and preserving natural resources, sustainability has become a critical objective for businesses and societies worldwide.

In this context, AR and XR technologies can play a significant role in promoting sustainability.

By reducing the need for physical travel, AR and XR help minimize carbon emissions associated with transportation.

Remote support and training through AR and XR empower field workers, reducing the need for on-site visits and optimizing operational efficiency. This not only saves time and resources but also reduces the overall carbon footprint.

Furthermore, AR and XR technologies enable organizations to visualize and analyze real-time data related to energy consumption, waste generation, and other environmental parameters.

Data-driven approach helps identify areas for improvement, make informed decisions, and implement sustainable practices.

Chapter 2: Understanding Carbon Emissions

To address the challenges of climate change, it is crucial to understand carbon emissions and their impact on the environment. In this chapter, we will explain the concept of carbon emissions, greenhouse gases, and their contribution to global warming. We will explore the concept of carbon footprint and its measurement, highlighting the significance of tracking and reducing emissions for a sustainable future

2.1 The Basics of Carbon Emissions

To address the challenges of climate change, it is essential to understand carbon emissions and their impact on the environment. Carbon emissions refer to the release of carbon dioxide (CO2) and other greenhouse gases into the atmosphere, primarily as a result of human activities such as burning fossil fuels, industrial processes, and deforestation.

These emissions trap heat in the atmosphere, leading to global warming and climate change.

2.2 Greenhouse Gases and Global Warming Potential (GWP)

Carbon dioxide (CO2) is the most prevalent greenhouse gas, but there are also other significant contributors such as methane (CH4) and nitrous oxide (N2O). Each greenhouse gas has a different capacity to trap heat and contribute to global warming. To compare the warming potential of different gases, scientists use a metric called Global Warming Potential (GWP), which measures how much heat a greenhouse gas can trap over a specific period compared to CO2.

Understanding GWP helps assess the overall impact of different emissions on climate change.

2.3 Carbon Footprint

A carbon footprint is a measure of the total greenhouse gas emissions produced directly and indirectly by an individual, organization, or product. It takes into account emissions from the entire lifecycle of a product or service, including the extraction and processing of raw materials, manufacturing, transportation, use, and disposal.

Measuring and managing carbon footprints is crucial for identifying emission sources, setting reduction targets, and implementing sustainable practices.

2.4 Importance of Tracking and Reducing Carbon Emissions

Tracking and reducing carbon emissions are crucial for mitigating climate change and achieving sustainability goals. By understanding the sources of emissions and their impact, organizations can implement targeted measures to reduce their carbon footprint. This includes adopting cleaner energy sources, optimizing energy efficiency, implementing sustainable transportation practices, and engaging in responsible supply chain management.

By taking proactive steps to reduce carbon emissions, organizations can contribute to the global effort to combat climate change and create a more sustainable future

2.5 Scope 1, Scope 2, and Scope 3 Emissions

Carbon emissions are categorized into three scopes:

- **Scope 1 →** Direct emissions from sources owned or controlled by an organization, such as on-site fuel combustion and transportation fleets.
- **Scope 2 →** Indirect emissions from the generation of purchased electricity, heat, or steam consumed by an organization.
- **Scope 3 →** Indirect emissions that occur as a result of an organization's activities but are produced by sources not owned or controlled by the organization. This includes emissions from the supply chain, transportation of goods, and product use.

Understanding these different scopes allows organizations to identify emission hotspots and develop comprehensive strategies to reduce their overall carbon footprint.

Chapter 3: Remote Support and Empowering Field Workers

AR and XR facilitate seamless collaboration and knowledge sharing among field workers, experts, and remote teams. By leveraging these technologies, organizations can create virtual collaboration spaces where individuals can communicate, share information, and work together on projects regardless of their physical location. This not only reduces the need for travel but also enhances the efficiency of decision-making processes, leading to reduced environmental impact and improved sustainability outcomes.

3.1 Reducing Carbon Emissions with Remote Support

One of the significant contributions of augmented reality (AR) and cross reality (XR) technologies to sustainability is the ability to provide remote support. Traditional support methods often require field technicians or experts to travel to the location, resulting in carbon emissions from transportation. By leveraging AR and XR, organizations can minimize the need for physical travel, thereby reducing carbon emissions associated with support and maintenance activities. Remote support allows to provide real-time guidance and assistance to field workers, who can access the information and instructions through AR and XR devices.

This technology ensures efficient troubleshooting, minimizing downtime and the need for unnecessary travel.

3.2 Empowering Field Workers for Sustainable Practices

AR and XR technologies empower field workers by providing them with tools and information that enhance their efficiency, productivity, and safety. By equipping field workers with AR and XR devices, they can access real-time data, instructions, and overlays, improving their ability to perform tasks accurately and efficiently. These technologies provide enhanced safety measures through real-time hazard alerts, virtual training simulations, and remote collaboration, reducing the risk of accidents and injuries in the field.

This leads to reduced errors, optimized workflows, and increased productivity, ultimately contributing to sustainability efforts.

3.3 Optimal Resource Utilization through Remote Monitoring

AR and XR technologies also enable remote monitoring and data visualization, allowing organizations to optimize resource utilization and reduce waste. By collecting real-time data from sensors and connected devices, organizations can monitor energy consumption, water usage, and other resources, identifying areas for improvement and implementing efficient resource management strategies.

This data-driven approach helps minimize resource waste, lower environmental impact, and reduce operational costs.

Chapter 4: Scenarios - Leveraging AR & XR for Sustainable Practices

In this chapter, we explore specific scenarios where augmented reality (AR) and cross reality (XR) technologies are employed to achieve sustainability goals. These scenarios demonstrate how AR and XR contribute to reducing carbon emissions, optimizing resource utilization, and promoting environmentally responsible practices across various industries.

4.1 Assistance during Production

Scenario 1: Remote Inspection of Production Phases (QCP/ITP)

AR and XR technologies enable remote inspection of production phases, allowing stakeholders such as customers and suppliers to virtually participate in Quality Control Points (QCP) and Inspection and Test Plan (ITP) processes. This reduces the need for physical travel to manufacturing sites, resulting in lower carbon emissions associated with transportation.

The concurrent virtual presence of all parties involved in the process streamlines decision-making, enhances collaboration, and speeds up production timelines.

Scenario 2: Final Acceptance Tests (FAT) with Remote Participation

AR and XR technologies facilitate final acceptance tests with remote participation from all concerned parties, including end-users, customers, inspectors, EPC contractors, and other stakeholders. By conducting FAT remotely, organizations save costs associated with physical inspections (Third Party Inspections - TPI) and minimize the carbon footprint associated with travel.

This approach ensures more flexible production plans, increased control of delivery schedules, and enhanced efficiency in the production process.

4.2 After Sales Assistance (O&M)

Scenario 1: Real-time Assistance to Field Personnel (FSE)

AR and XR technologies provide real-time assistance to field service engineers (FSE), allowing them to access expert support remotely for quick resolution of specific issues. Suppliers and contractors can also participate in this virtual support, leading to increased efficiency in field activities and easier planning of service activities.

This reduces the need for physical travel, lowering logistics costs, and minimizing carbon emissions associated with field service operations.

Scenario 2: Supply of Remote Services

Organizations can deliver remote services to customers using AR and XR technologies, reducing the need for on-site visits and thus lowering the carbon footprint.

By offering remote services, organizations can enhance efficiency in after-sales support, optimize resource utilization, and contribute to sustainable practices in the service industry.

4.3 Inspection, Audit, and Certification

Scenario 1: Remote Verification of Asset/Equipment Status

AR and XR technologies enable remote verification of asset and equipment status for certification and re-certification purposes. This approach reduces the need for physical site visits by surveyors, leading to increased efficiency and flexibility in the certification process.

By minimizing travel and streamlining verification procedures, organizations can achieve significant carbon emission reductions.

Scenario 2: Virtual Qualification of Plants and Assets

Using AR and XR technologies, organizations can virtually assess and qualify plants and assets. This approach optimizes the usage of resources (surveyors) and reduces process costs, contributing to sustainability efforts by reducing resource consumption and carbon emissions associated with traditional qualification methods.

4. 4 Training and Supervision

Scenario 1: Field Training for Personnel

AR and XR technologies offer immersive and interactive field training for personnel. By providing virtual training sessions, organizations enable faster learning, precise evaluation of abilities, and enhanced flexibility in planning training sessions.

This approach reduces the need for physical training facilities and associated travel, leading to cost savings and carbon emission reductions..

Scenario 2: Supervision of HSE Critical Activities

AR and XR technologies facilitate the remote supervision of Health, Safety, and Environment (HSE) critical activities. By remotely overseeing such tasks, organizations enhance safety in workplaces by reducing the number of people in hazardous environments.

This approach minimizes the risk of accidents and injuries, ensuring a safer working environment and contributing to sustainable HSE practices.

Chapter 5: Real Word Kiber Examples: CO2 Consumption and Savings

In this chapter, we present real-world examples showcasing the impact of Kiber's AR and XR solutions on reducing carbon emissions and promoting sustainability. Discover how remote interventions and cutting-edge technology contribute to a greener and more efficient industrial landscape.

Introduction

Kiber, a leading provider of augmented reality (AR) and cross reality (XR) solutions, has been at the forefront of industrial transformation since its inception. With a strong focus on the needs of the industry, Kiber has developed cutting-edge products and services designed to empower field workers in challenging environments, such as hazardous areas, industrial facilities, offshore platforms, and remote sites.

Kiber's Contribution to Sustainability:

Kiber's AR and XR solutions have a profound impact on the sustainability goals of its clients across industries like Oil & Gas, Energy, Manufacturing, Defense, and Maritime. By harnessing the power of AR technology, remote workers can rapidly diagnose, inspect, operate, and manage assets in the most demanding locations, eliminating the need for physical travel and thus reducing carbon emissions associated with transportation.

Kiber's innovative solutions have contributed to sustainability efforts by reducing carbon emissions, optimizing resource utilization, and enhancing safety in various industries.

5.1 Carbon Emission Analysis:

Kiber is committed to continuous improvement and sustainability.
To assess the carbon emissions associated with the production of their products, Kiber conducted an official report in collaboration with Opengroup Srl.

The study analyzed the composition of Kiber's K3S Standard Kit, which includes a Helmet, Handcam, and two Energy Units.

Potential Global warming GWP (Kg Co2 eq) for 2 standard K3S Kits	Upstream Scope 3	Core Scope 1,2	Downstream Scope 3 (distribution)	Carbon Footprint (Kg)
	627,97	44,09	15,12	**687,18**

The report indicated that the production of 2 kits results in approximately 687.18 kg of CO2 emissions.

The findings indicate that the total emissions for two complete Kiber kits amount to approximately 0.687 tons of CO2. This value is significantly affected by the electronic components present in the product.

In the following section, we will explore how the emissions avoided through reduced travel can effectively outweigh the emissions resulting from the product's purchase.

5.3 Emission Reduction through Remote Interventions:

By avoiding unnecessary travel, organizations can significantly lower their carbon footprint and contribute to sustainability efforts.

Kiber's AR and XR solutions enable remote support and assistance, facilitating inspections, audits, and certifications without physical presence. Data insights from three of our best customers, headquartered in Milan and Oslo, reveal significant emission reductions achieved through remote interventions. For instance, a company headquartered in Milan with secondary plants in Delhi or Cairo can achieve emission reductions of 2608.11 kg of CO2 for Delhi and 1146.58 kg of CO2 for Cairo through remote interventions. Similarly, for offshore facilities in the Northern Sea with the headquarters in Oslo, remote interventions result in substantial savings of approximately 3055.44 kg of CO2.

Scenario	**Emission Reduction through Remote Interventions (kg CO2)**
Company #1 Milan (HQ) to Delhi (Plant)	2608.11
Company #2 Milan (HQ) to Cairo (Plant)	1146.58
Company #3 Oslo (HQ) to Offshore Facility (Plant)	3055.44

These values represent the estimated carbon emission reductions achieved by conducting remote interventions using Kiber's AR and XR solutions.

5.4 Assumptions in Emission Calculations:

The report's findings were based on the collection of several data, including working hours of technicians, means of transportation (airplanes and helicopters), and emissions from overnight stays during trips. These calculations provide valuable insights into the potential carbon emission savings achieved through the adoption of Kiber's solutions.

5.5 Conclusion:

As Kiber continues to develop its technologies with a focus on sustainability, the company remains committed to supporting its clients in their journey towards a greener and more sustainable future

Kiber's AR and XR solutions have proven to be an instrumental tool in promoting sustainability and environmental responsibility within industries such as Oil & Gas, Energy, Manufacturing, Defense, and Maritime.

Scenario (recap)	Emissions per single sale of two standard kits (kg CO2)	Emission Reduction through Remote Interventions (kg CO2)
Milan (HQ) to Delhi (Plant)	687.18	2608.11
Milan (HQ) to Cairo (Plant)	687.18	1146.58
Oslo (HQ) to Offshore Facility	687.18	3055.44

By offering remote support and assistance, optimizing resource utilization, and enabling safer and more efficient work practices, Kiber has played a pivotal role in reducing carbon emissions and driving sustainable industrial practices.

Chapter 6: Beyond CO2 Savings: Reduced Downtime, Travel Costs, and Increased Safety

AR and XR technologies not only contribute to CO2 savings but also offer additional benefits that contribute to sustainability efforts. This chapter will explore the advantages of using AR and XR, such as reduced downtime, lower travel costs, and increased safety measures. We will discuss how these benefits further enhance sustainability by improving efficiency and minimizing resource consumption.

Faster and more efficient problem-solving processes lead to increased productivity and optimized workflow, ultimately enhancing overall operational efficiency.

6.1 Reduced Downtime and Enhanced Productivity

One of the key advantages of Kiber's AR and XR solutions is the reduction of downtime in critical operations. By providing real-time remote support and access to real-time guidance, field workers can quickly diagnose and resolve issues, minimizing equipment downtime and production interruptions.

The ability to conduct inspections and provide support remotely also saves valuable time, allowing resources to be allocated more efficiently.

6.2 Cost Savings from Reduced Travel

By leveraging AR and XR technologies for remote interventions, organizations can substantially reduce travel costs. Avoiding the need for experts and technicians to travel to various sites for inspections and maintenance tasks results in significant cost savings on transportation, accommodation, and other related expenses.

By visualizing this data overlayed on their field of view, workers can make informed decisions, leading to more effective maintenance strategies and optimized asset utilization.

6.3 Enhanced Safety and Risk Mitigation

AR and XR technologies provide real-time access to data and analytics, empowering field workers with essential information on asset performance, environmental conditions, and operational metrics.

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By visualizing this data overlayed on their field of view, workers can make informed decisions, leading to more effective maintenance strategies and optimized asset utilization.

6.5 Enhanced Training and Skill Development

Kiber's AR and XR solutions offer immersive and interactive training experiences for field personnel, enabling faster learning and precise evaluation of skills. Additionally, Kiber's solutions can train workers in handling complex or hazardous tasks safely, further enhancing workplace safety.

Organizations can use virtual training programs to upskill their workforce, reducing training costs and accelerating the onboarding process for new employees.

6.6 Efficient Collaboration and Knowledge Sharing

AR and XR technologies foster seamless collaboration and knowledge sharing among teams, experts, and remote workers. Virtual collaboration spaces allow individuals to communicate and work together, regardless of their physical location.

This efficient collaboration streamlines decision-making processes, accelerates problem-solving, and enhances overall operational agility.

Chapter 7: Conclusions

In conclusion, Kiber's AR and XR solutions represent a groundbreaking leap in technological innovation, reshaping industries and driving sustainability efforts forward. Throughout this paper, we have explored the transformative potential of augmented reality (AR) and cross reality (XR) technologies in promoting sustainability, reducing carbon emissions, and fostering a greener future.

Kiber's commitment to meeting the specific needs of various industries has paved the way for a more efficient and eco-conscious industrial landscape. By enabling remote interventions, organizations can reduce the carbon footprint associated with physical travel while ensuring uninterrupted operations and increased productivity.

Chapter 7: Conclusions

Beyond CO2 emissions savings, Kiber's AR and XR solutions offer several cross-industry benefits, including reduced downtime, enhanced training, improved customer experiences, and heightened compliance and security. By empowering the workforce with real-time information and remote support, organizations can optimize operational efficiency, streamline processes, and exceed customer service expectations.

As companies worldwide seek to achieve net-zero emission targets and embrace digital transformation, Kiber's AR and XR solutions emerge as a driving force in this transformative journey. By leveraging cutting-edge technology, organizations can simultaneously drive sustainability efforts and boost their competitive edge.

Chapter 7: Conclusions

In the ongoing fourth Industrial Revolution, Kiber stands at the forefront of industrial transformation, supporting businesses in their pursuit of efficiency, sustainability, and excellence. The journey towards a greener future begins with every organization taking the step towards implementing innovative solutions that Kiber has to offer.

In essence, Kiber's AR and XR solutions not only reduce carbon emissions and optimize resource utilization but also empower industries to be agile, productive, and resilient in the face of change.

Together, let us shape a more sustainable world and embark on a path towards a brighter, greener, and more technologically-advanced future with Kiber.

Want to see Kiber solution in action?
Contact us to get a free demo and see for yourself how our solution will help you to improve efficiency and productivity.

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