Introduction to Internet of Things
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Lecture – 54
Industrial Internet of Things – Part – II

So, let us now continue our discussion of industrial IoT. So, earlier we understood the basics of IIoT, how IIoT differs in principle from regular IoT what is the difference between IoT and M-2-M and having understood all of these different basic concepts we are now about to understand that what are the specific applications of IIoT in the industrial sector.

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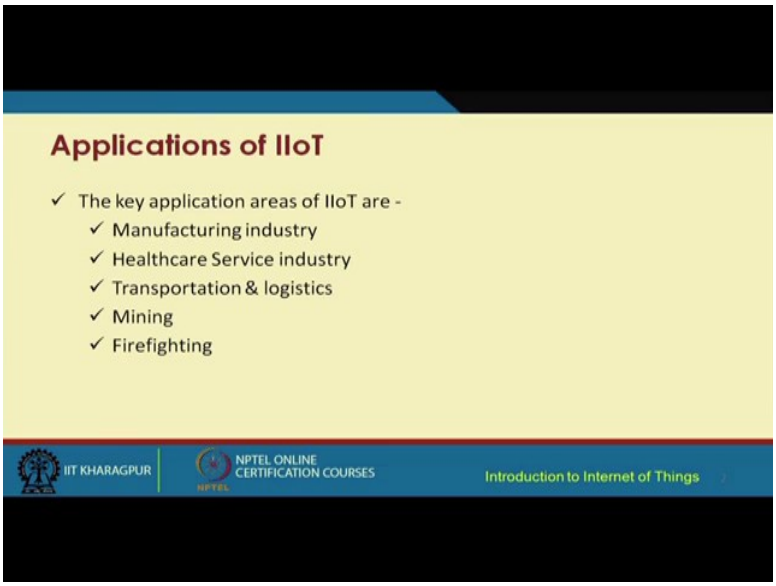

So, some of the key application areas of IIoT are manufacturing industry, health care industry, transportation and logistics mining and firefighting.

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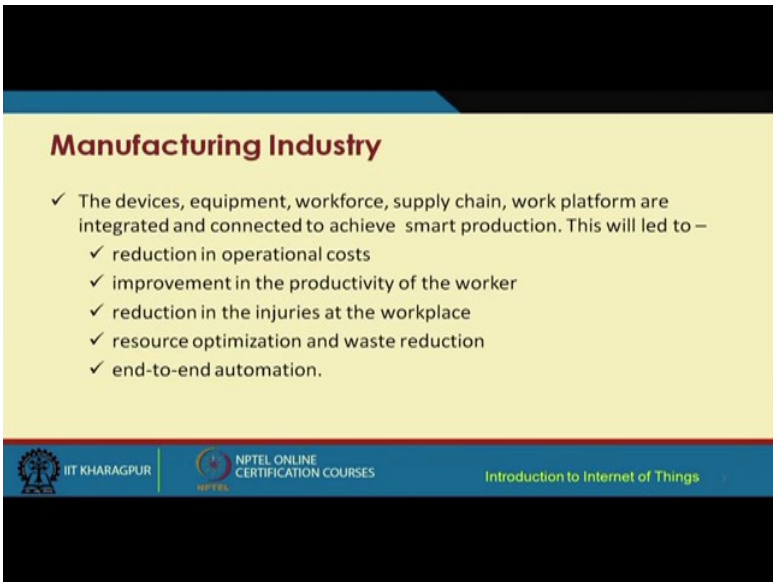

In terms of manufacturing in a manufacturing industry there are lot of manufacturing devices there are equipments work force supply chain work platform different work platforms are there. So, these have to be integrated and connected to achieve smart production. So, they have to be internetworked. So, we have different manufacturing machines manufacturing devices equipments work force then the entire supply chain manufacturing supply chain from production to the end users the entire supply chain and then the work platform. So, all of these have to be integrated and connected to improve the production overall industrial production.

So, these have to be done in order to reduce the operational costs improve the productivity of the worker reduce injuries at the workplace this is very important actually safety applications of IIoT are very important these are very interesting and these are very popular safety applications. So why we want to use IIoT is one of the important applications is to improve the safety in the manufacturing plant in the industrial different other types of plants. Resource optimization and waste reduction is also very important industrial you know this is a very important problem resource optimization is a very important problem in a industrial engineering. So, this has to be taken care of waste reduction as well and end to end automation. So, this is very important in it is a very important requirement in the manufacturing industry and it has to be taken care of.

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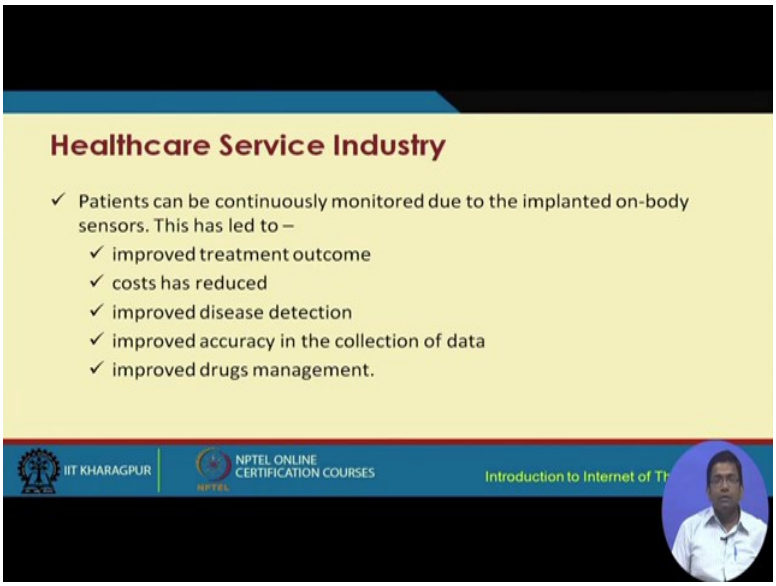

In the second application of IIoT is in the health care sector. So, you know using IIoT solutions patients can be continuously monitored due to the implanted on body sensors which can improve the treatment outcome overall costs of treatment can be reduced, improved disease detection can be done and improved accuracy from the data; that is that are collected can be achieved an overall the drugs drugs that are administered on the patients and the overall inventory. The control of the drugs, the procurement control storage and so on of the drugs they can be improved.

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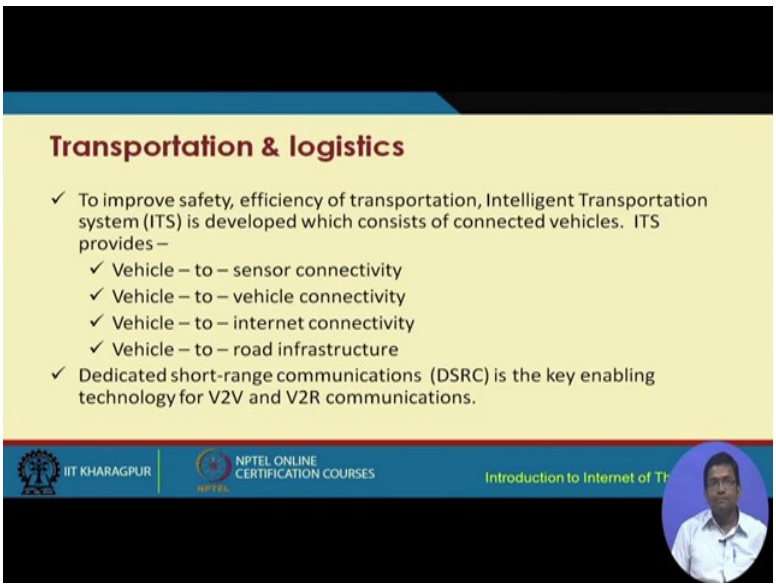

So, IIoT solutions are very attractive in the health care sector in the transportation and logistics sector as well in order to improve transportation safety, efficiency of transportation, intelligent transportation systems can be developed which consists of connected vehicles. So, one of the key building blocks for transportation IIoT applied to transportation is the concept of intelligent transportation system or connected vehicles. So, intelligent transportation systems come in different forms we have the concepts of in its we have the concepts of vehicle to sensor connectivity, vehicle to vehicle connectivity, vehicle to internet connectivity and vehicle to road infrastructure connectivity.

So, there are different types of connectivity's that are required in its there is short range communication in the form of DSRC that enables the realization of vehicle to vehicle and vehicle to road infrastructure communication V2V, V2R sometimes it is also known as V2I, V2 Vehicle to infrastructure communication.

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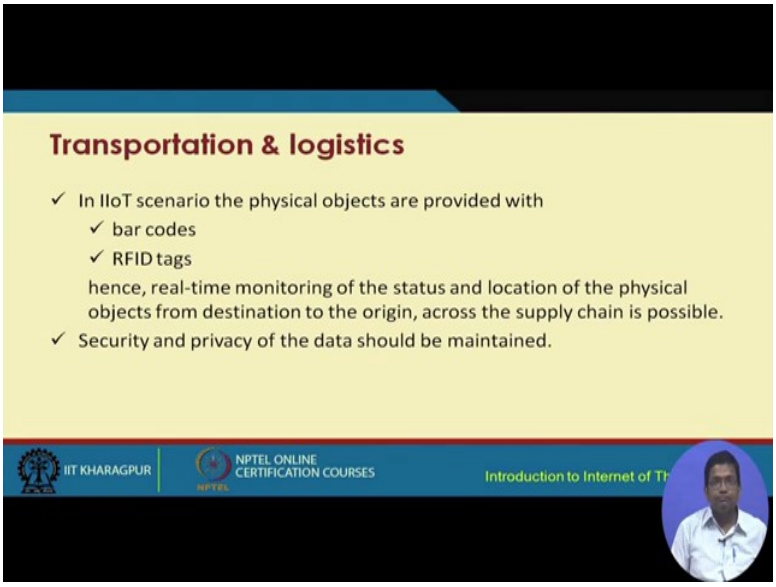

So, DSRC is very important key enabling technology for achieving the objective of vehicle to vehicle and vehicle to roadside infrastructure communication. In IIoT scenario the physical objects are provided with bar codes RFID tags. So, that real time monitoring of the status and location of the physical objects may be the trucks where they are what you know what is the condition of the different goods that are carried in the trucks all of these things can be monitored in real time from the origin irrespective of where the trucks are entire supply chain

can be monitored with IIoT solutions entire supply chain the status of the good that status of the vehicle you know everything can be monitored.

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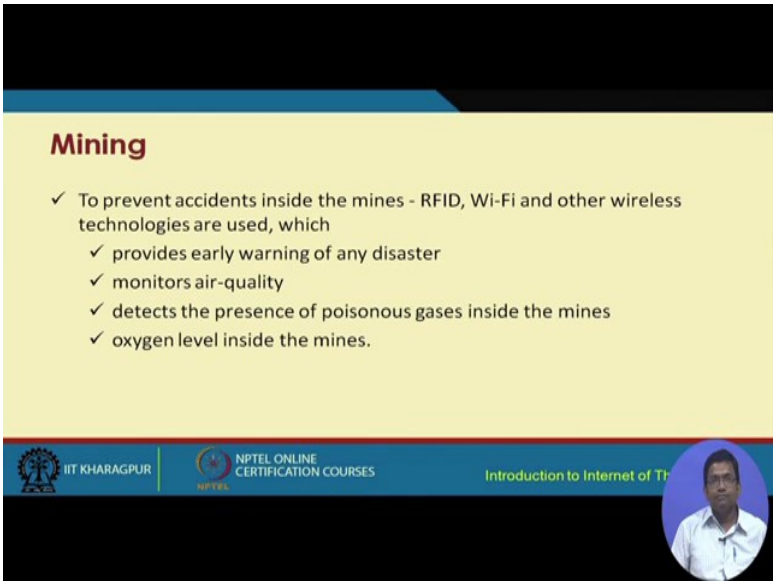

Security and privacy of the data should also be maintained and that is quite obvious I do not need to elaborate further on this particular aspect. In the mining industry very important industrial IIo, sorry industrial IoT solutions are very important in the mining industry it is very common to have different types of accidents in the mines. So, RFID based solutions are Wi-Fi and different other sensors and other wireless technologies Zigbee, Bluetooth, etcetera can be deployed to collect data to provide early warning before any disaster actually strikes can be used in the mines to improve to monitor not improve, but monitor the air quality what is the air quality

And this is the very important problem in the mining sector you know monitoring the air quality inside the mine detecting the presence of different types of poisonous gases SOx gases NOx gases and you know different other poisonous gases like carbon mono oxide and so on inside the mine which is a very common problem. How much is the oxygen level inside the mine? So, all of these things can be monitored inside the mines using IIoT solutions.

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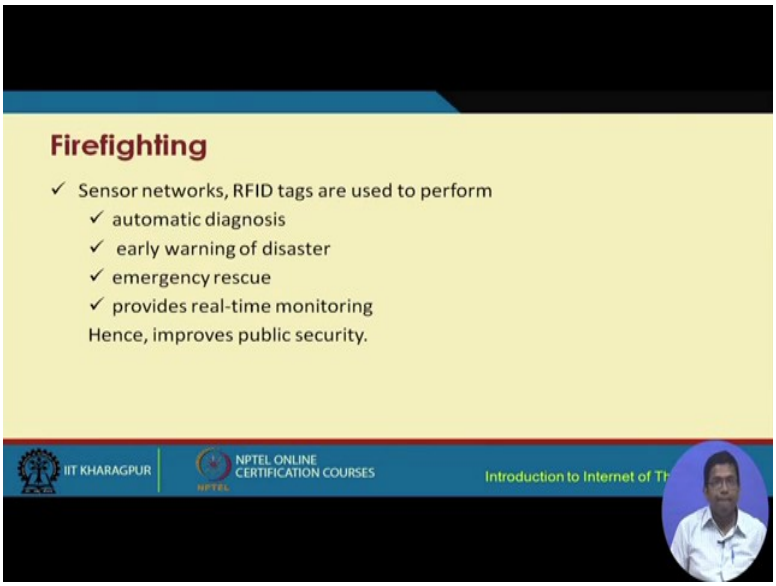

Firefighting is another RFID tags can be fitted to these different devices for firefighting for automatic diagnosis early warning in the you know in the firefighting in the fire infrastructure that are deployed typically in the buildings different RFID tags different sensors can be fitted to these you know fire detection devices emergency rescue and providing real time monitoring. So, all these will improve the overall overall security and safety of public infrastructure.

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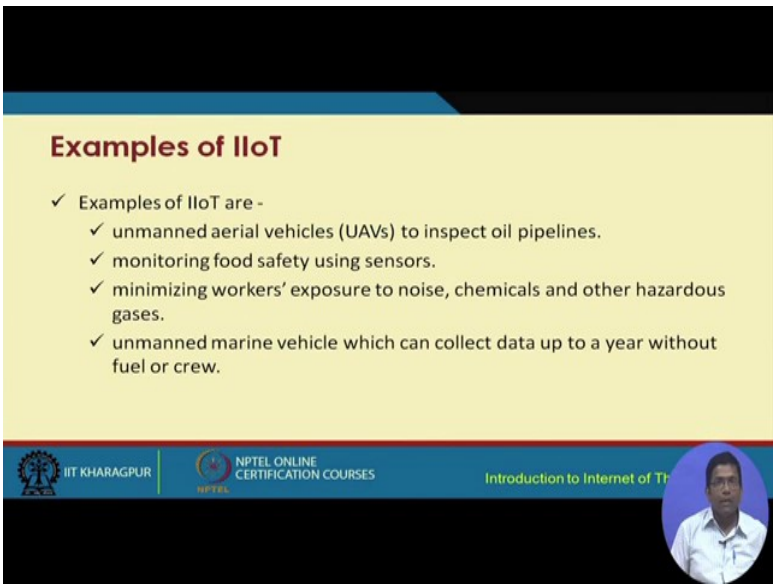

So, some of the examples of IIoT include use of unmanned aerial vehicles or the drowns to inspect oil pipelines monitoring food safety using sensors minimizing workers exposure to noise chemicals hazardous materials and so on unmanned marine vehicles can be deployed to collect data you know annually or throughout the year throughout the months and so on without any fuel or crew.

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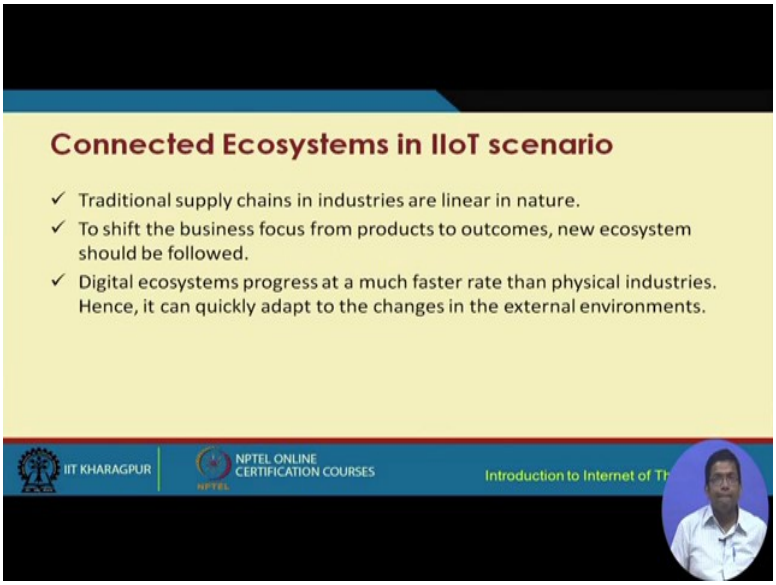

So, what we have are connected ecosystems in the IIoT domain. So, what we have is we have traditional supply chains and these traditional supply chains in these industries are linear typically linear in nature. So, it is required to shift the business focus from products to outcomes and for that these digital ecosystems can come IIoT based digital ecosystems can come to rescue. So, digital ecosystems progress at much faster rate than the physical industries. Hence it can quickly adopt sorry adapt to the changes in the external environments.

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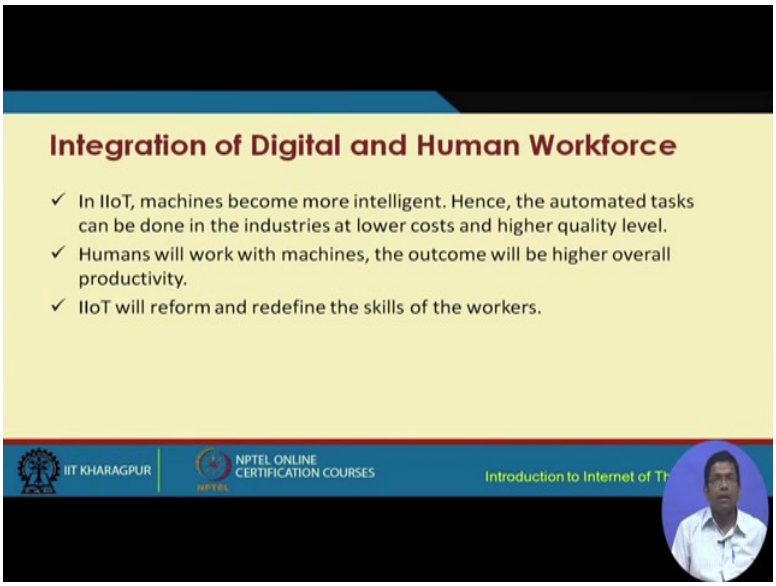

So, it is required to integrate digital technologies with the human work force. So, you know IIoT cannot be exclusively M-2-M this we have to remember we have to have humans in the loop. So, humans will work with machines and the overall outcome will be improved productivity of the system.

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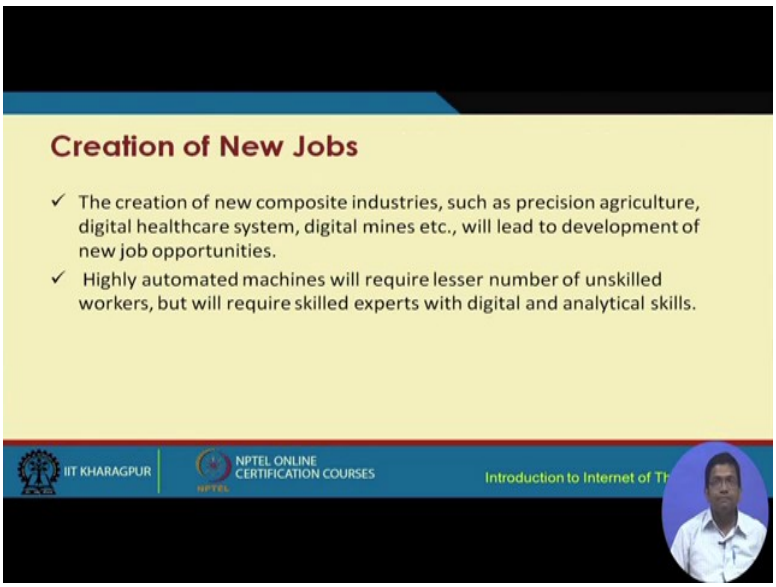

So, IIoT will reform and redefine the skills of the workers. New jobs can be created with the help of IIoT it is not that you know typically people think that automation or IIoT based

solutions will cut down on the number of jobs, but that is not true. So, jobs new jobs get get created because you know new technologies get introduced.

Things like a you know new composite industries precision agriculture digital health care digital mines these require you know skilled man power and these skilled man power is what is required and you know this automation through IIoT is in turn going to create new jobs with requiring new skill sets and you know. So, this basically you know IIoT will not cut down on the required number of jobs in the industries.

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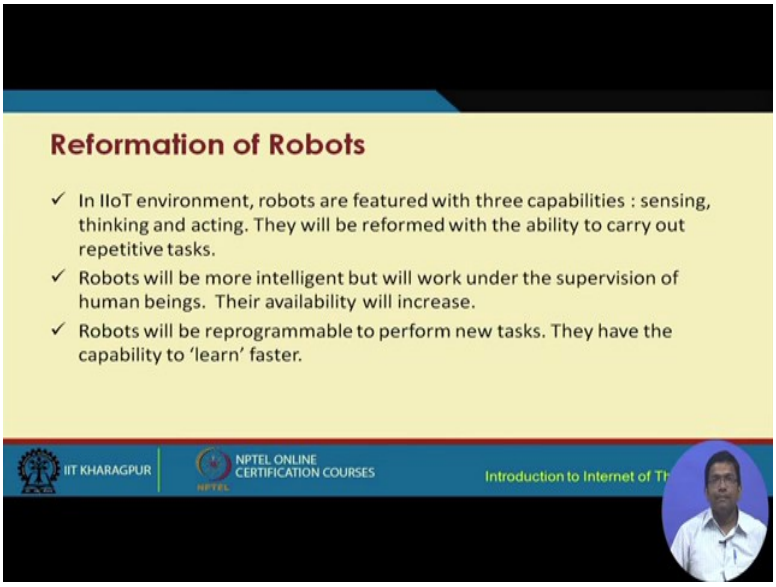

Robots robots have traditionally been used in the industry and in IIoT robots are a very important component you know in a new form in a new way robots can be used and these robots can sense they can think they can act they can perform different tasks. So, they will be formed with the ability to carry out repetitive tasks robots will be more intelligent they are more intelligent and they walk under the supervision of, they can also work under the supervision of human beings their availability increases and they can be programmed reprogrammed and so on and so forth to perform new tasks and that way they can learn faster.

So, robots in a reformed manner can be used in the IIoT to perform the industrial processes in a much more efficient manner in much more faster way decisions can be made and so on; over all improving the industrial processes industrial you know efficiency industrial safety and so on.

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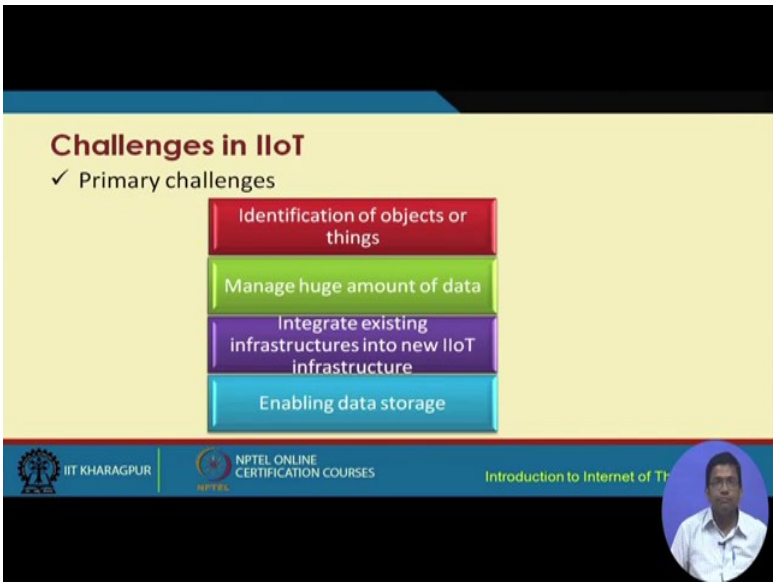

So, some of the challenges of IIoT, building IIoT are listed over here identification of objects or things is important and we already looked at the identification of these things you know how do you associates identifiers to these things we have already looked into these in the context of regular IoT and the same applies here as well.

Managing huge amount of data is another challenge to be worked on in order to address the problems of IIoT in order to deploy IIoT solutions integrating existing infrastructure into new IIoT infrastructure and enabling data storage these are some of the challenges behind IIoT. There are safety challenges as I told you before safety is very important. It is a fundamental problem in the industry in the industrial sector safety is crucial.

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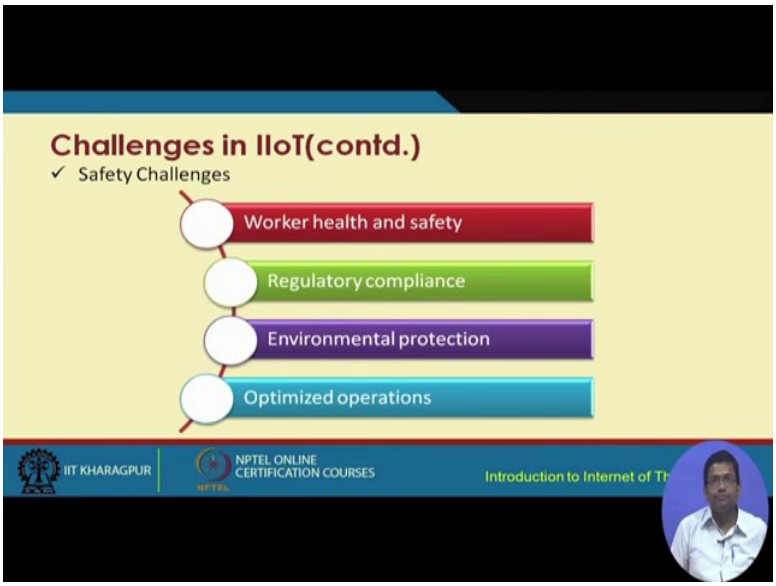

So, whether we are talking about the health care industry because you know in the health care industry as well in the hospitals and health care workers they are exposed to lot of problems they are exposed to lot of challenges and which can harm their health and so on.

The same thing for if we are talking about mining industry if we are talking about the transportation industry if we are talking about the steel industry and different other industries there are lot of safety challenges that are there and so, workers health and safety are of primary concern in this industry. So, worker health and safety regulatory complains there are different regulatory bodies in a requiring you know complains of the machines the people their processors in the industry and so on. So, these and regulatory compliance with respect to safety particularly is very crucial.

Environmental protection is very important you know industries and environment they often do not go hand in hand. So, lot of challenges exist and lot of challenges are posed by the industries on the environment in which they work then optimized operations. So, these are some of these challenges particularly concerning safety in industrial safety that have to be taken care of through IIoT solutions.

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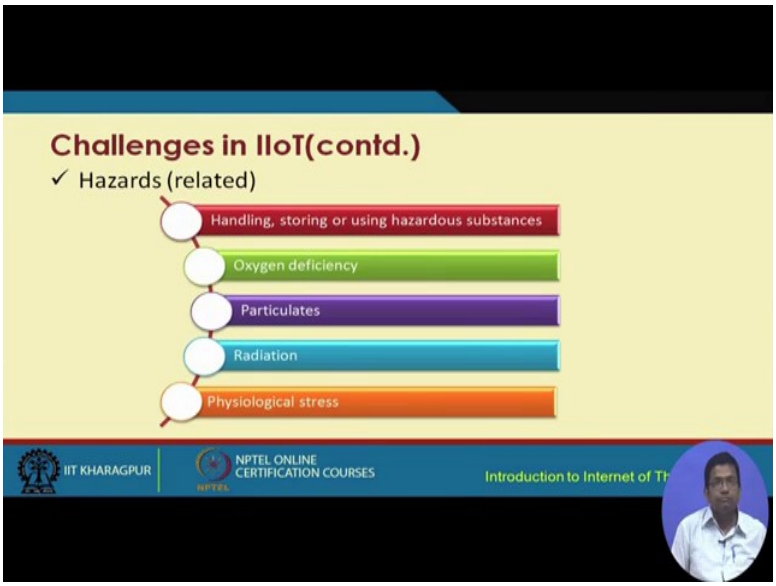

There are different hazards as well handling of different hazardous substances storing of the hazardous substances and so on oxygen deficiency particulate matters. So, particulate matters like you know fly ash and so on then radiation different types of radiation electromagnetic radiation and so on and physiological stress all these are different types of hazards.

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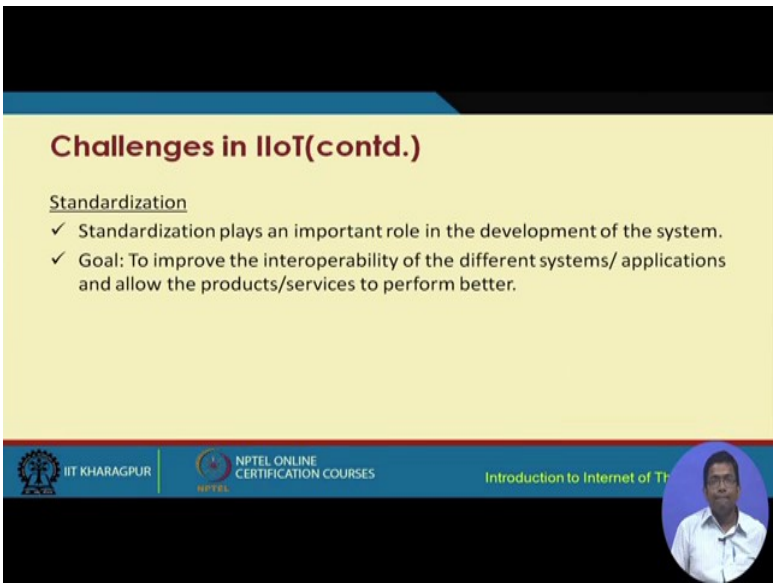

That have to be taken into consideration for offering challenges through the use of IIoT. Standardization is very important in the development of any system. So, in the context of

IIoT what is required is to improve the interoperability of the different systems applications and allowing the products and services to perform better.

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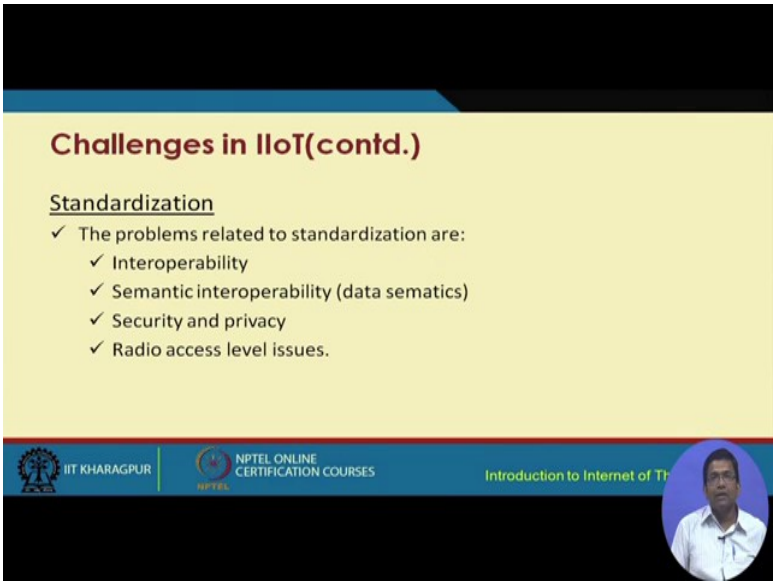

In terms of standardization the problems related to standardization include interoperability semantic interoperability. So, there is a difference. So, in semantic interoperability basically one is focusing on data semantics. So, the meaning; so, the you know interoperability in terms of semantics is what semantic interoperability specifically takes care security and privacy and radio access level issues.

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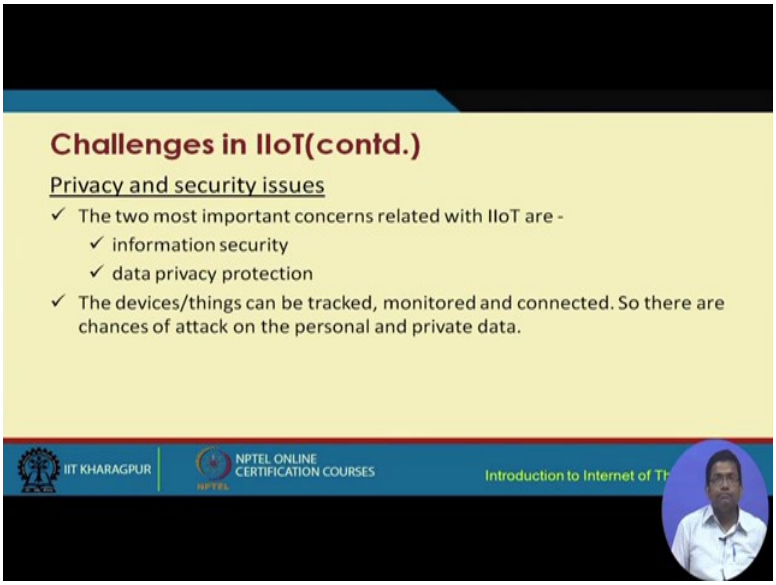

There are different privacy and security issues as well the two most important concerns needed with IIoT are information security and data privacy protection the devices and the things can be tracked monitored and connected. So, they there are chances of attack as it happens in any other type of network as well this IIoT is also a network; it is a huge network where different machines crucial machines there are different systems humans everybody is connected.

So, these are prone to different attacks there could be different vulnerabilities in these networks. So, consequently, you know. So, these has to be taken care of the security issues have to be taken care of privacy is very crucial because from the industry there are different data the sensors are collecting.

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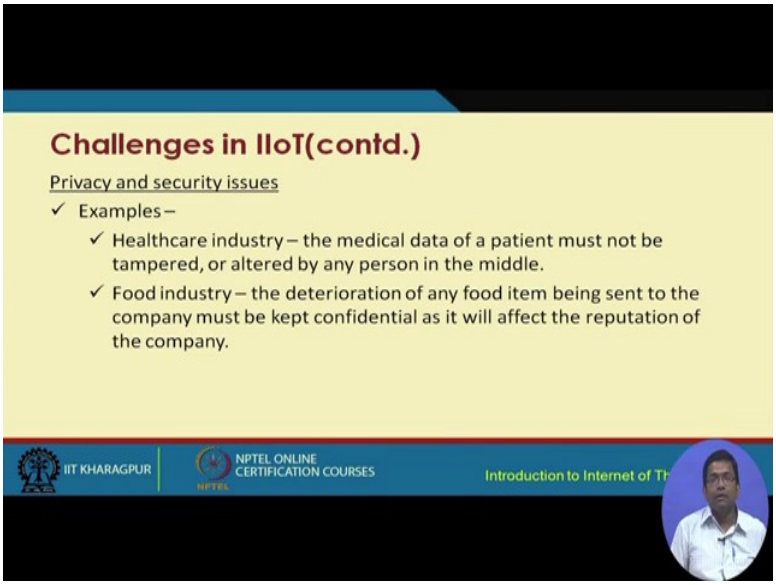

So, the privacy of these data have to be take care of. So, information security data privacy protection all these are very crucial issues in the context of IIoT building of IIoT.

So, for example, in the health care industry the medical data of the patient must not be tampered or altered by any person in the middle in the food industry the deterioration of any food item that is being sent to the company should be kept confidential as it will affect the reputation of the company.

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So, these are very important you know privacy challenges or security challenges posing the building of IIoT solutions. Through IIoT a sorry though IIoT provides new opportunities, but few at factors may cause the hindrance in the path to success these include the lack of vision and leadership lack of understanding of values among the management employees costly sensors and in adequate infrastructure. So, these are some of the risks that are that are faced by people who want to the management who want to deploy IIoT in the industry.

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So, other challenges include improvement at the sensors miniaturization of the sensors is very crucial you know we are talking about you know day by day we are talking about very small scale small sized sensors that can perform as good as if not better than these existing big sized sensors. So, miniaturization of the sensors is very important nowadays, we are talking about name spaced sensors which make the senor the shape of the size of the sensor very small and these seniors can perform very well as well even if they are small in size. They can perform very well and the overall by through the miniaturization process the overall cost and energy consumption the overall cost can be brought down and the energy consumption can also be addressed can also be improved because small sized sensor is lightly to consume less energy compared to bigger sized sensors.

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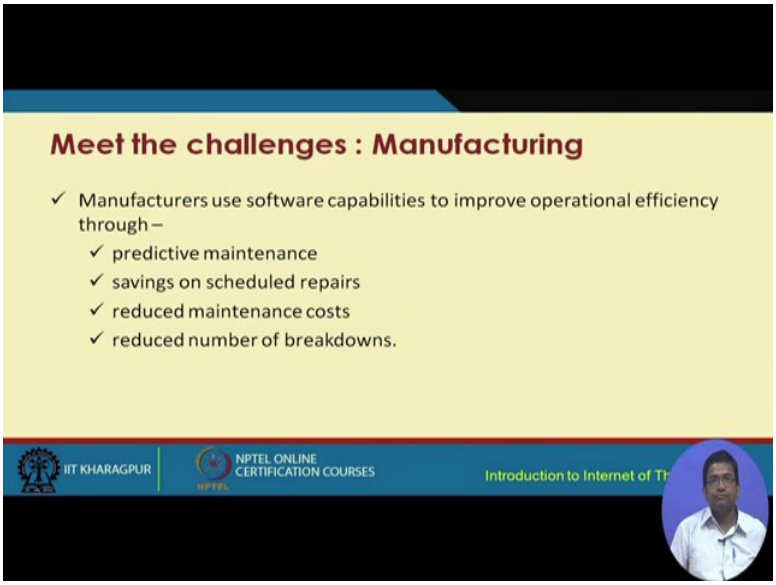

So, the others challenges with respect to manufacturing. So, you know when we are talking about manufacturing typically these are software based computer based and these are used to improve the overall operational efficiency. So, predictive maintenance savings on scheduled repairs reduced maintaenance cost maintenance costs and reduced number of break downs are important challenges and important issues that have to be taken into consideration while trying to introduce IIoT in the manufacturing industry.

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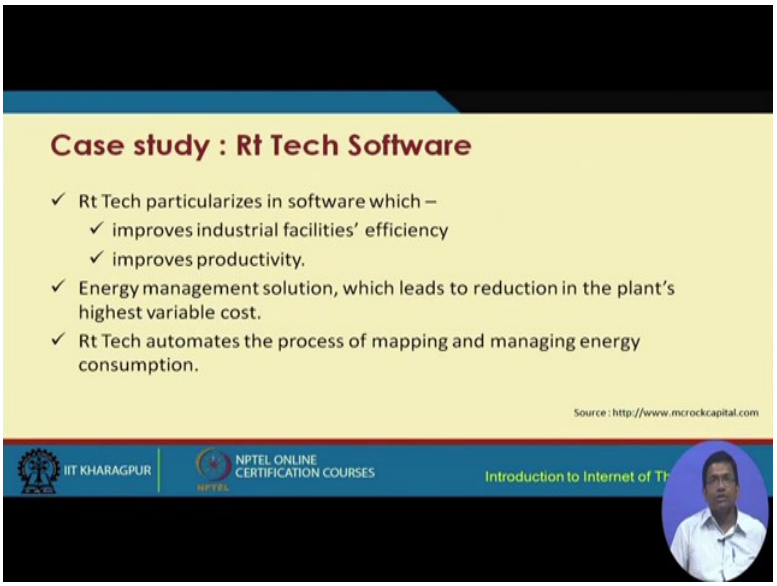

So, there was an industry the Rt tech software. So, this basically particularizes in software which improves the industrial facilities efficiency and improves the overall industrial productivity. So, energy management solution which leads to reduction in the plants highest variable cost was a produced was designed and this particular company automates the processes of mapping and managing energy consumption.

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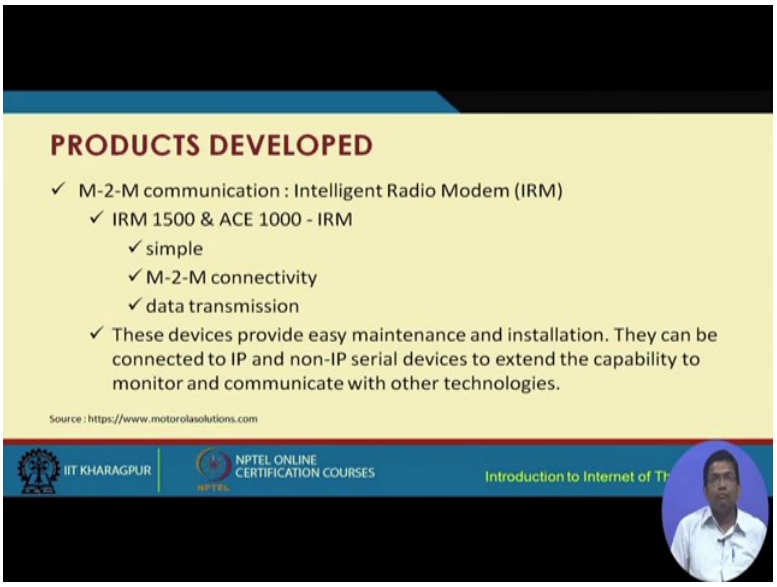

The products that they develop include M-2-M based communication based systems and intelligent radio modems and these are the some of these products and their specifications

given over here these devices provide easy maintenance and installation they can be connected to IP or non IP devices to extend the capability to monitor and communicate with other technologies.

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So, this is a solution that they have developed a product that they have developed it is known as control which offers IO link to the master gateway. So, it can be easily integrated into the industrial network with existing and new installations, it supports Ethernet and IP and also supports the mod bus TCP. So, there are different benefits of IIoT improving the connectivity among devices improving efficiency updating the scalability.

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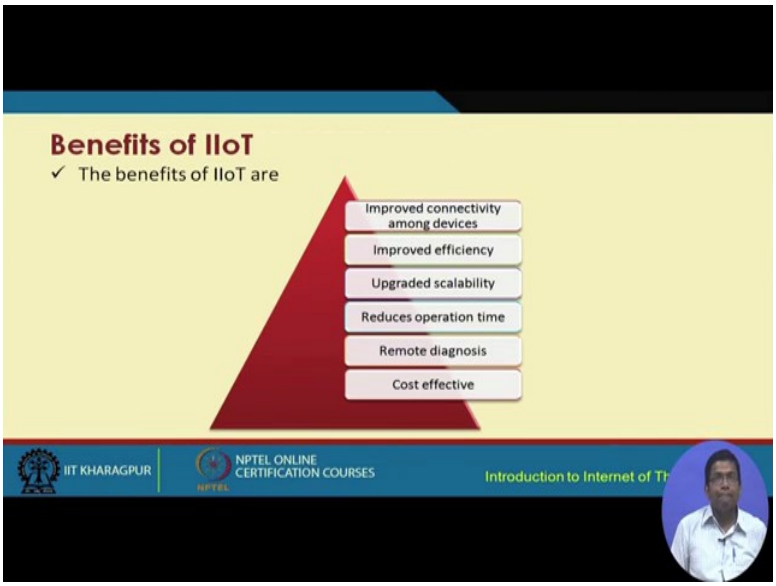

So, easily one can scale up by the use scale up in the industrial sector industrial processes can be scaled up, industrial you know overall industrial productivity can be scaled up through the use of IIoT reduction in the operation time can be achieved in the industry through the use of IIoT solutions remote diagnosis can be performed quite efficiently with the help of IIoT and IIoT solutions offer cost effective solutions.

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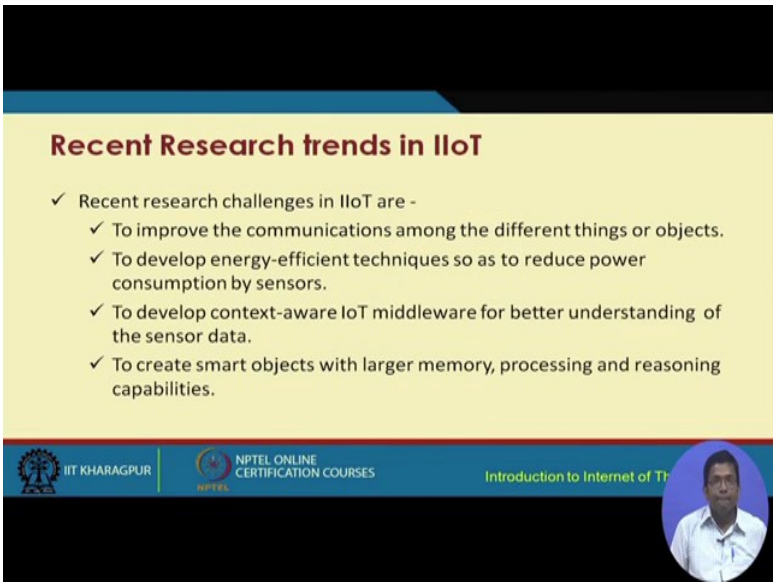

In terms of the research recent research trends one is to improve the communication among the different things or objects to second is to develop energy efficient techniques. So, as to

reduce power consumption by the sensors third is to develop context aware internet of things middleware for better understanding of the sensor data and the forth is to create smart objects with larger memory processing and reasoning capabilities.

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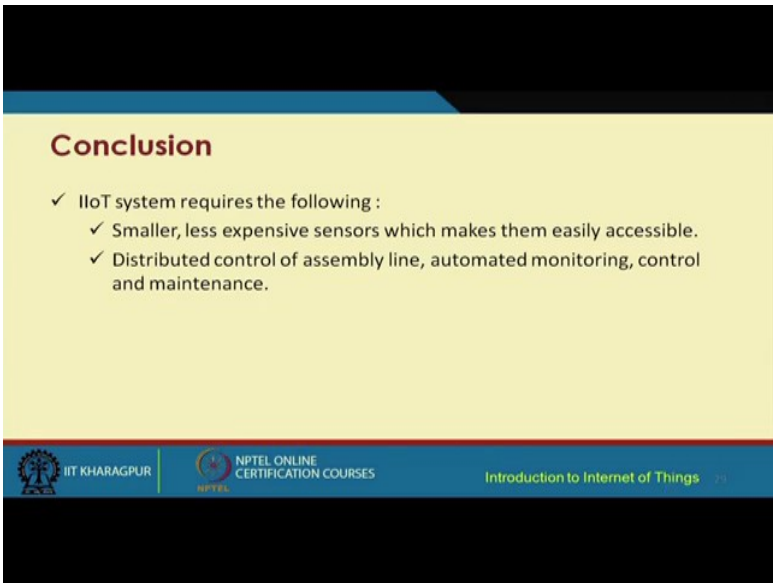

So, these are some of the different features the different applications of IIoT and how IIoT can improve the productivity in the industry in the different plants manufacturing plants the health care sector and so on.

So, IIoT systems they have requirement for very small sized less expensive sensors which are easily accessible and so, this basically will help in the furthering the use of IIoT more in the industry then the second thing is the assembly line. So, you know controlling the assembly line automates monitoring control and maintenance of the industrial processes and the industrial product lines these can be achieved efficiently with the help of industrial IoT.

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So, these are some of the references and these can be you know. So, this reference is good for understanding connected vehicles it was published in the IEEE Internet of Things and this is something that I should mention that on internet of things there is a journal which is called the IEEE Internet of Things journal which has number of papers on the different aspects of industrial internet of things.

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So, this concerns basically in transportation sector like this there are different other problems and solutions mining related papers are also available, safety related papers on the use of IIoT

are also available. So, these are the different references. And so, with this we come to an end of the discussions on industrial IoT.

Thank you.