Good morning everybody.

The program is Bachelor of Science first year. Subject:Industrial chemistry, Semester-I Paper code is CHC151, Paper title is General Industrial Chemistry. The title of the unit is actually Unit 4. Material balance Without chemical reaction, The name of the module is flow diagram for material balance processes ,with or without recycle. The module number is 9. I'm Mrs Brenda Dias Barreto from P.E.S College. The outline of this topic is material balance without chemical reaction. The flow diagram with or without recycle. What are the learning outcomes in this topic? we have Meaning of material balance without chemical reaction, using flow diagram explaining the material balance with or without recycle. Material balances without chemical reaction. It is actually an outline which shows the pathway of a process and the economics of a reaction. The Pathway of a process meaning the reactants reacting to give us the products. The economics of a

reaction meaning the profit of a reaction which is obtained. From the Law of conservation. For industrial process we have input minus accumulation is equal to the output. If the accumulation is nil, then the input or the reactants will actually give you the output or the products in most cases for reactions or chemical processes, the reactants should be equal to the products. That is, the input should be equal to the output, but in some cases there is accumulation which is obtained. If you see this example material balances without chemical reaction, if you consider the example, there is an accumulation for a storage tank of drinking water. If you consider the input as a, that is the amount of water present in the storage tank and the removal of the drawing or water from the tank is b. Under these circumstances, the input is not equal to the output.

And the accumulation is a --b.So what we have here is in this case, there is accumulation that is actually the water which is present in the storage tank which is a main requirement for the storage tank.

In the second reaction of the second example, we have a continuous nitration process wherein the feed or the

reactants which contains benzene, nitric, acid, sulfuric acid, and water this reacts to give us the product that is Nitrobenzene that is obtained now at the end of the reaction there is no accumulation here, so here input is equal to the output.

This is a flow diagram which tells you the pathway of a reaction. How the reaction will actually take place, or a process or a chemical process which takes place. In this case, the reactants, which are also termed as the feed, fed into a processing unit. Or you can say in a reactor which gives you the products and we get the inerts which are obtained. Now in this case the inerts are actually the material which is unreacted, so we have the unreacted matter which is present. So usually when we write a material balance, material balance actually tells you what we're feeding in the reactor and what is obtained at the end of the reaction. So in this case, when we are considering we have reactants or feed is equal to the products plus the inerts, the products are obtained and the inerts will be the Unreacted matter which is obtained, now in this case, if the inerts are nil, or there are no inerts which are present, that means all the reactants have reacted to give us the products. So this gives a

balanced chemical equation, or we get maximum yield of the product is obtained.

Now, examples of material balances without chemical reactions. In material balance without chemical reaction, it actually does not involve a chemical reaction taking place, but they do undergo chemical processes which are taking place In this case. if you see the examples are distillation: in distillation, what is done actually is a crude product is taken in as the reactants and we get a purified product which is obtained. Same thing in case of evaporation. In case of evaporation you have a solute and solvent which is present. So what is done is at a higher temperature the solvent is removed and only the solute is obtained. In case of mixing or blending. That is, we take two or three materials ,raw materials which are actually fed in a blender and we get the respective size of the product which is obtained. So, in case of extraction of oil, in this case of extraction we get oil that is from the soybean, groundnut, coconut etc. So in this case what is actually done is the raw material is fed in the processing unit where oil is extracted and you get the waste product that is the cake or the

waste is obtained. So this results in the extraction of oil. Besides this examples we also have other examples like adsorption, absorption, all these involve chemical processes. Then we have a material balance with or without recycle. In case of processes with recycle. In the recycle process what is actually done is here, If you see in this flow diagram, what we have is the reactants are reacting, they pass through the processing unit, you get products and you get inerts. Inerts are actually the unreacted matter which are obtained. This unreacted matter is fed back as a recycle with the reactants so it can be seen in the flow diagram that the inerts or the unreacted matter is fed back as a recycle with the reactants, so reactants plus part of the inerts go back to the processing unit and the products are obtained. So in case of recycle process part of the product stream is fed back with the feed that is reactants to obtain the products.Now, what does this do? This increases the yield of the product. Sometimes when we get the yield of the product is not much. It is a little amount that is obtained. So in order to get more amount of the product, this recycling process is carried out.. So this recycling process increases the yield of the product and it also

increases the working of the machinery which takes place in the processing unit. So in this case, the reactants which give the products and the inerts undergo recycling so that we get more yield of the product which is obtained. So recycling process basically include increasing the yield of the product.Now if you see the other reactions, that is, it takes place without recycle. In case of without recycle process, the product stream is not sent back with the reactants or the feed. So in this case the feed is directly converted into the products and there is maximum formation of the product. So there is no need to actually carry out the recycle process and the yield of the product also is substantial. So in this case the end of the product is substantial so there is no need to actually carry out the recycle process so there are two types of reactions which take place. One is with recycle where in the end product is increased and the other is without recycle process where we get a substantial formation of the product is obtained. So with these other reactions which take place here in the material balances. That is with or without recycle.

Now the references which are being used here is the first one is Mhatre,Narkar and Pathak U.G.C.study material for industrial chemistry. The second one is College Industrial Chemistry, Himalaya publishing house. By Singh, Joseph ,Dhavale and the other is the Industrial Chemistry by BK Sharma, Krishna's educational publishers.

Thank you.