Introduction to Lean Construction
Professor. N Raghavan
Department of Civil Engineering
Indian Institute of Technology, Madras
Module - 01
Understand the Applications of CPS/LPS through Case Studies

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Hello everyone. So far we were looking at CPS as a basic process and we looked at the explanations, how to practice it and so on. In this session, we will look at some of the Case Studies.

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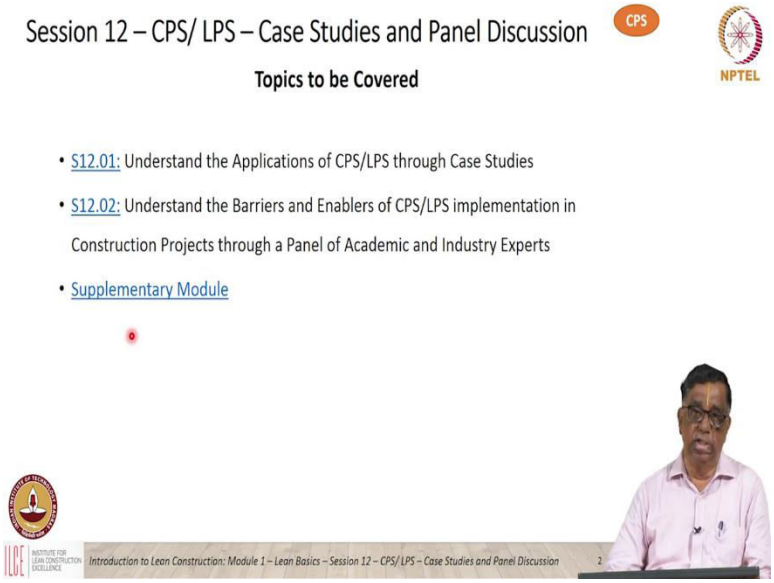

So, the main intention in this session is to present to you some case studies, how different organizations have been practicing CPS? And then we will have a Panel Discussion between people in the industry and the academia to discuss what are the common enablers and what are the barriers for practicing CPS and what is the overall process?

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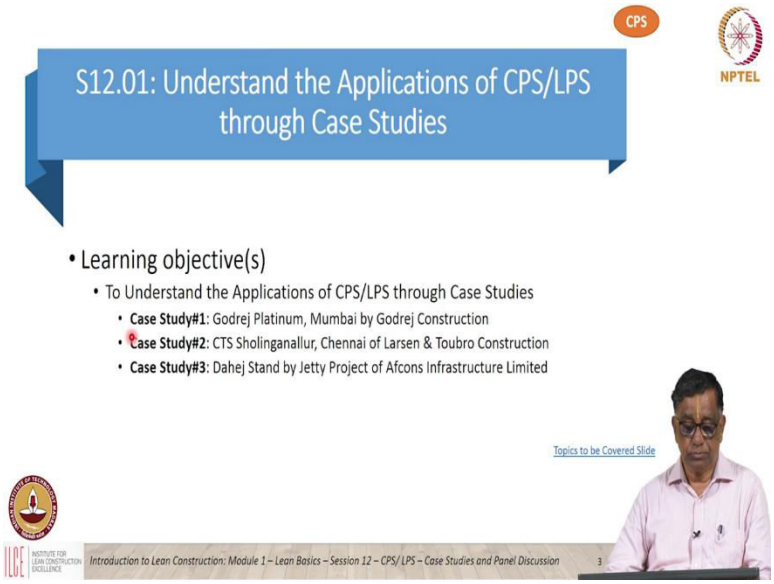

So, the first session, we have three Case Studies, one from Godrej Construction, one from Larsen and Toubro Construction, and the third by Afcons Infrastructure.

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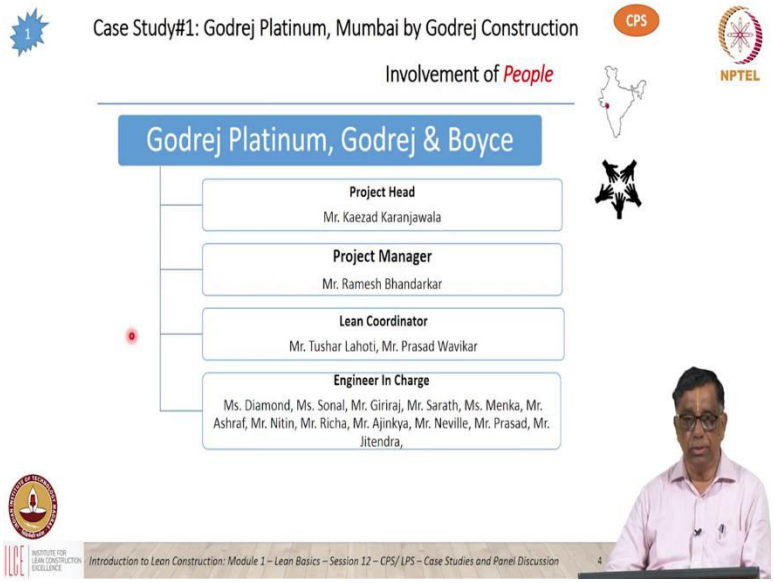

So, the first one is building called Platinum done by Godrej Construction, as a main developer and promoter, they engage individual contractors, subcontractors for doing the actual construction work. So, Godrej and Boyce is the main client agency, and they are actually practicing lean in their various projects.

So, the first step actually, they said, we need to identify the people and then sending out a circular saying all these people are involved in the project. So, they get a sense of involvement and motivation.

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So, creating awareness, they had the separate meetings, first for the Engineers, and then for the contractors, explaining exactly what is lean, what are the methods and processes, they are going to follow, and you know, the various steps and so on. And of course, the expectations from the on the outcome from the entire exercise. Then they also identify the various activities involved in doing CPS, and various other things like constraint analysis, weekly meeting, performance awards, we will go through all these.

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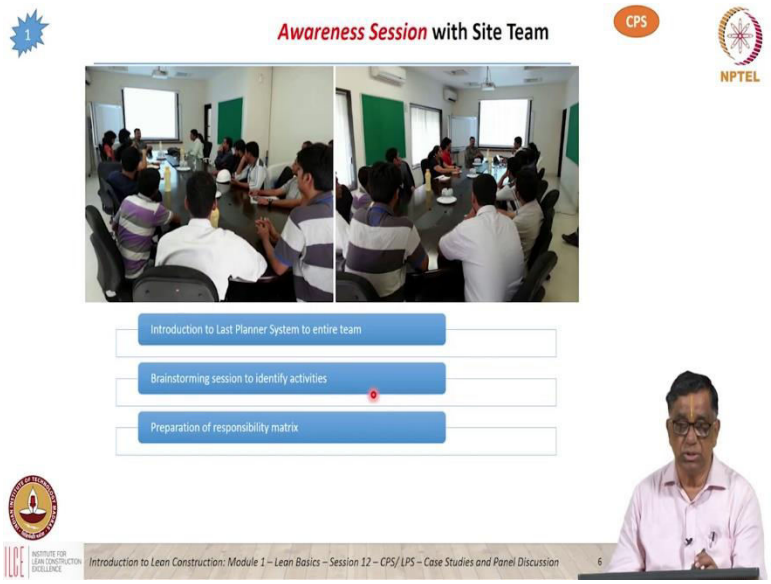

The first thing, I think part was creating the Awareness. So, they had several meetings with people. Because, the lean planning thing was a new concept to the entire construction team. So, they were initially questioning, why make a change? Would, what do we need to involve introduce lead construction? So, we had to have about three or four initial sessions, to explain to them what exactly is lean, how to practice, what are the advantages, and so on, how to prepare for launching lean in their project site.

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So, then what they did, actually, they had a responsibility matrix with a large project. So they are divided the project into a number of components and a number of trades, for example, HVAC separately, then, the other signage's. And all these things were made identified. And for each, they identified one person or the same person can do more exercises for introducing and implementing Lean.

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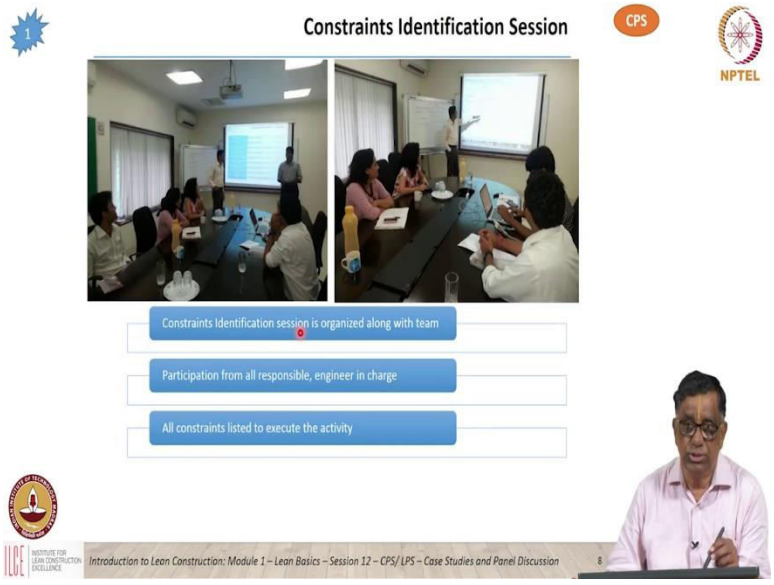

At the head, separate meetings with all the people to identify the constraints, that is very, very important. Constraint analysis has to be done by a cross functional team. Because you know,

only the Civil Engineers, or only the Mechanical Engineers, they do not have a global picture of the entire construction process components, all that. And we need to have the cross functional teams sitting together and discussing identifying the constraints and the remedy measures.

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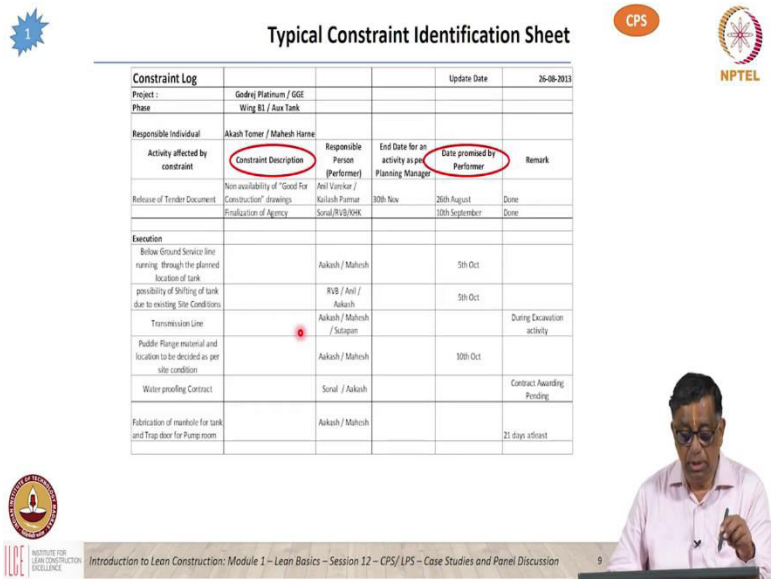

Constraint Log				Update Date	26-08-2013
Project :	Godrej Platinum / GGE				
Phase	Wing B1 / Aux Tank				
Responsible Individual	Akash Tomer / Mahesh Harne				
Activity affected by constraint	Constraint Description	Responsible Person (Performer)	End Date for an activity as per Planning Manager	Date promised by Performer	Remark
Release of Tender Document	Non availability of "Good For Construction" drawings	Anil Vinekar / Kailash Parmar	30th Nov	26th August	Done
	Finalization of Agency	Sonal/RVB/KHK		10th September	Done
Execution					
Below Ground Service line running through the planned location of tank		Aakash / Mahesh		5th Oct	
possibility of Shifting of tank due to existing Site Conditions		RVB / Anil / Aakash		5th Oct	
Transmission Line		Aakash / Mahesh / Sutapan			During Excavation activity
Puddle Flange material and location to be decided as per site condition		Aakash / Mahesh		10th Oct	
Water proofing Contract		Sonal / Aakash			Contract Awarding Pending
Fabrication of manhole for tank and Trap door for Pump room		Aakash / Mahesh			21 days atleast

So, once I did that, they made a chart like this, what are the various constraints, who is a person to you know, the responsible person, by what date and then they had a mechanism of reviewing this chart from time to time and then see how it is going, whether the constraints are being resolved properly or not.

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And they had a very great commitment to the ultimate clients for delivering the projects on time. So, the milestones are very, very, very important to them for doing the various floors for completing civil work going on with MEP and so on. So, they were all the time checking the congregants with the milestone planning and the look at plans.

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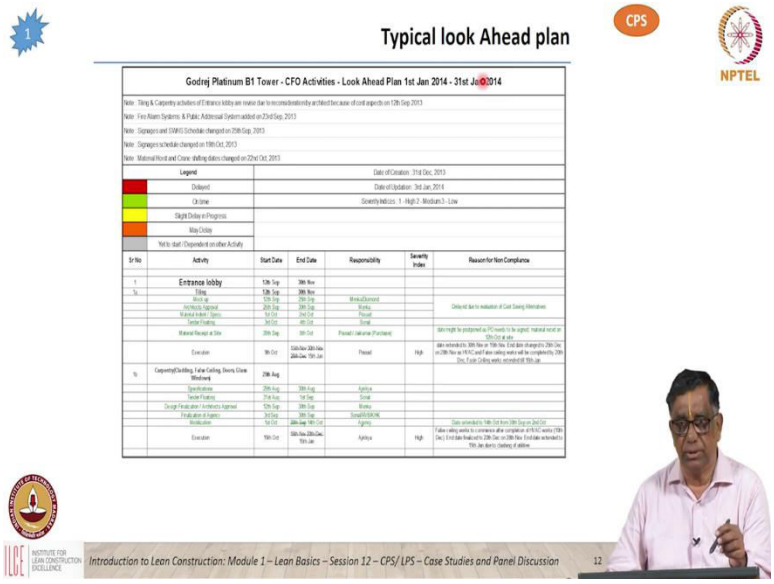

And they had, always a combined meeting involving all the Site Engineers for creating the Look Ahead plan. And the Look Ahead plan was made in a chart like this. You do not really need to, there are no standard, we have given a standard method and a standard template. But different organizations can adapt it to suit their own processes, their own internal processes, and what they feel comfortable with. But the basic elements, all will have to be there, they can be only rearranged in different formats and practiced accordingly.

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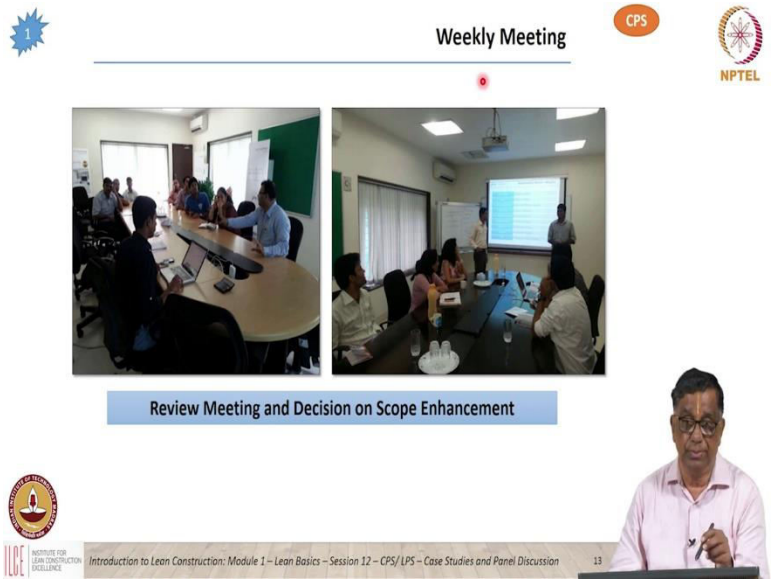

And they had frequent Review Meetings. And wherever the Scope changes changed, again, they had to involve all the people to make sure it had no adverse impact on the overall timeline, because the commitments to the clients were considered to be quite important and sacrosanct.

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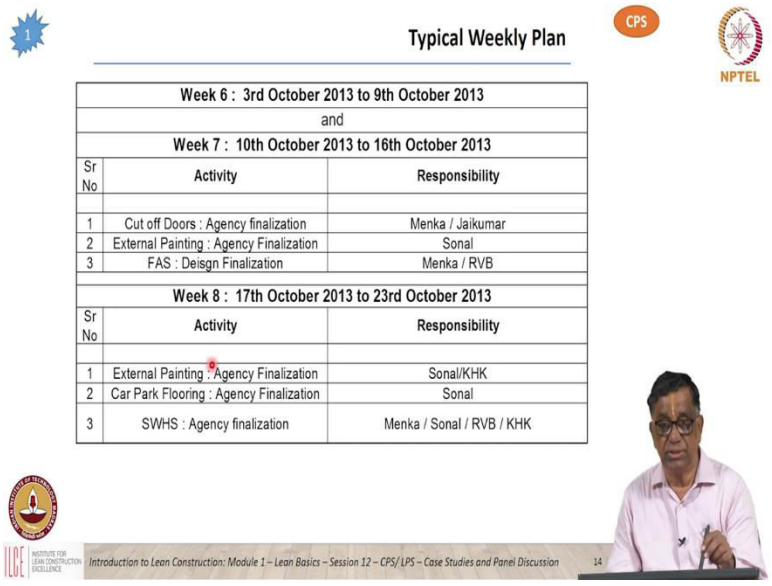

Week 6 : 3rd October 2013 to 9th October 2013		
and		
Week 7 : 10th October 2013 to 16th October 2013		
Sr No	Activity	Responsibility
1	Cut off Doors : Agency finalization	Menka / Jaikumar
2	External Painting : Agency Finalization	Sonal
3	FAS : Deisgn Finalization	Menka / RVB
Week 8 : 17th October 2013 to 23rd October 2013		
Sr No	Activity	Responsibility
1	External Painting : Agency Finalization	Sonal/KHK
2	Car Park Flooring : Agency Finalization	Sonal
3	SWHS : Agency finalization	Menka / Sonal / RVB / KHK

And again, Typical Weekly Planning, instead of having a chart like that, they also had specific points. And they had photographic records of what they plan and what they were achieved, at which they had to show their management.

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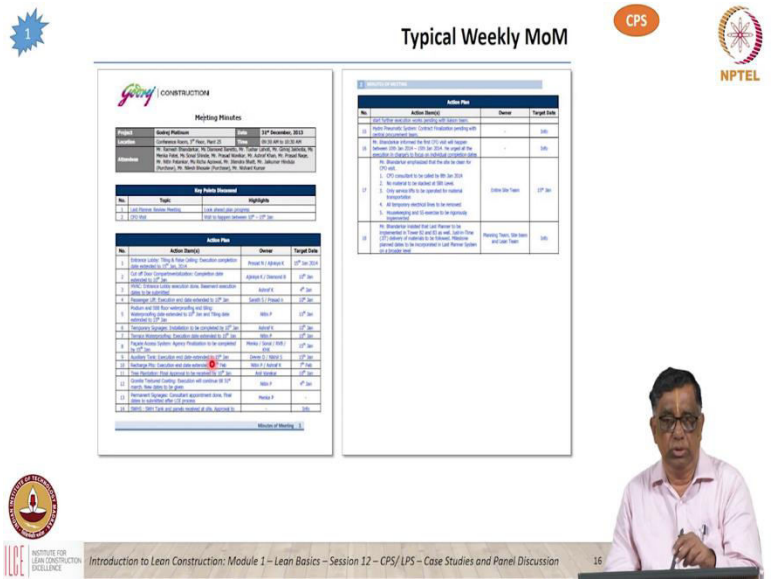

And they had the various line items in the form of minutes of meeting, what was planned, what was achieved, by what date and so on, so the minutes of meeting kind of approach was followed, to make sure that they were staying on course.

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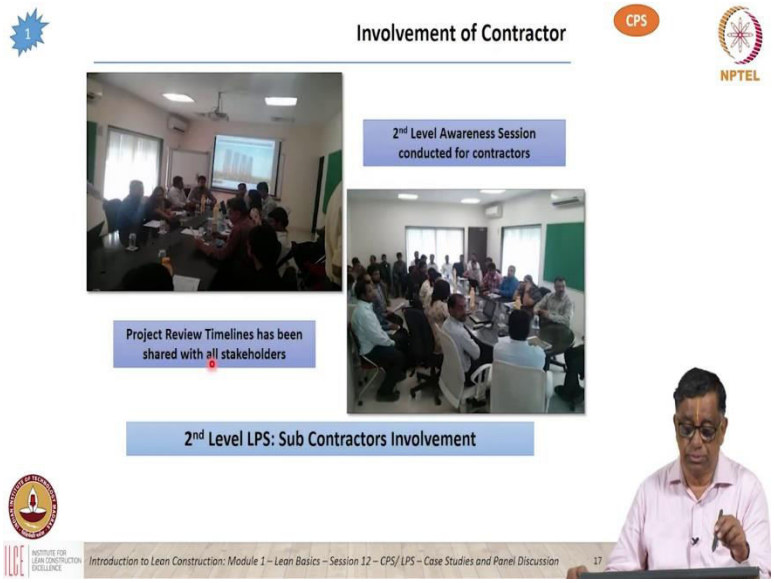

And then they also involve their contractors and subcontractors, they also were brought on board. Initially, they were very reluctant to come on board to sit in the planning process. They used to keep on saying that, sir, you please tell us what needs to be done, we will do it. But do not ask us to plan.

So, it was the tough process bringing them on board in the Lean process, getting them to sit together, understand what is the constraint, understand what is the root cause. So, all that was done involving them, and that paid a lot of dividends finally, they were also enthusiastic participants finally.

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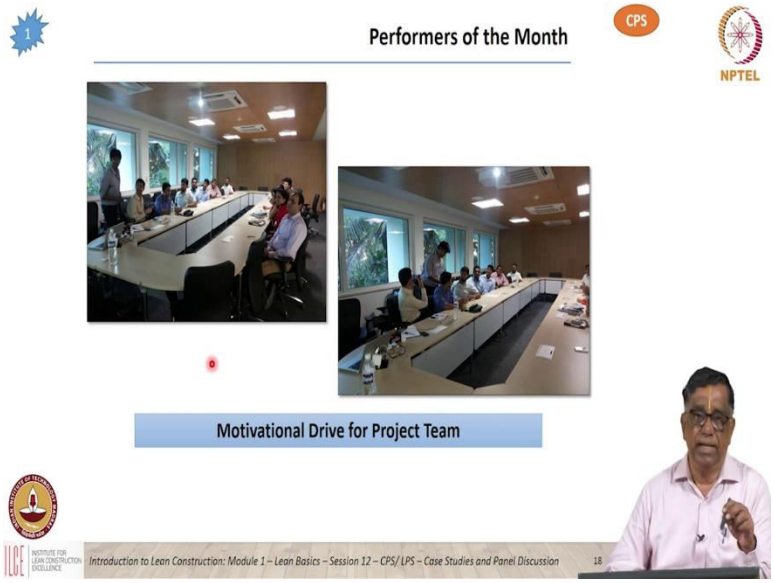

And then they had a good system of rewarding the best players, to the best performer of the month, for example, was chosen and recognized, in front of the other colleagues, that again, was a great morale booster involved, so good competition healthy competition, and by the good idea.

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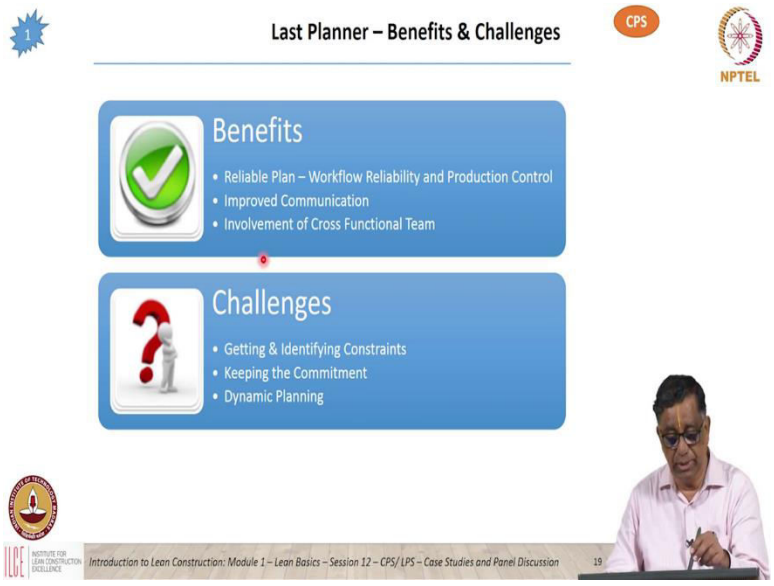

And they captured, what are the very benefits they got and what are the challenges they had to overcome, and these were actually displayed in charts in number of places in the workplace. So, the people were constantly reminded of what they can achieve by practicing lean successfully. So, all in all, Godrej Construction is still a good practitioner of Lean construction, and they have

derived a lot of benefits. Today, the Chairman of ILCE for example, is the head of Godrej Construction.

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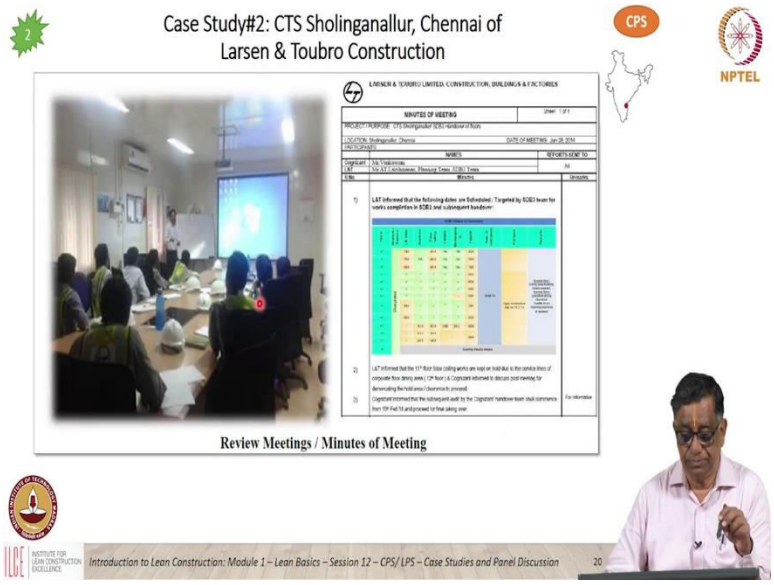

The second case study we have from a Jetty project, sorry, from a building project at Sholinganallur, on OMR in Chennai, for Cognizant Technologies. And this is for Larsen and Toubro Construction. L&T had very traditional strong project management systems, but still they were open to experimenting with Lean.

And this project, they did that and they found that there were many benefits. So, initially, they had a first review meeting, briefing meeting to tell people exactly what is lean, how to practice it and so on. And traditionally, they have a minutes of meeting kind of system, so that they capture the main points discussed, what were the comments coming from people and what action was taken on that.

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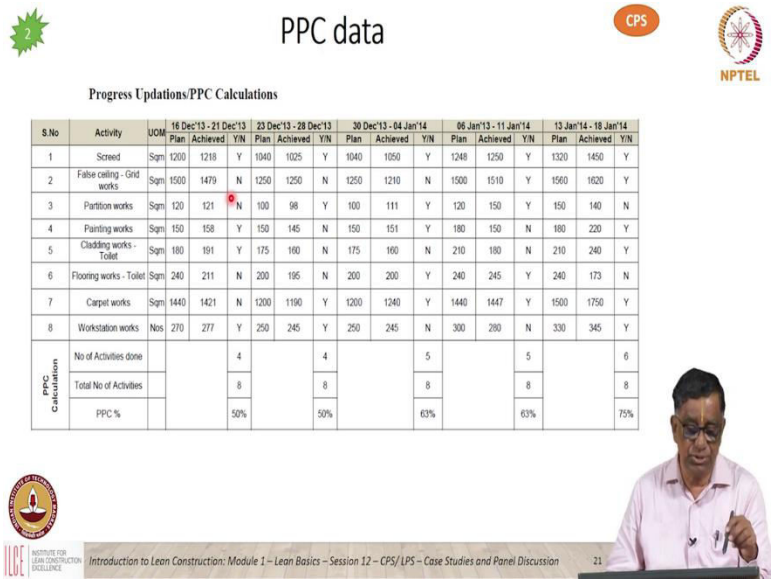

S.No	Activity	UOM	16 Dec'13 - 21 Dec'13			23 Dec'13 - 28 Dec'13			30 Dec'13 - 04 Jan'14			06 Jan'13 - 11 Jan'14			13 Jan'14 - 18 Jan'14		
			Plan	Achieved	Y/N	Plan	Achieved	Y/N	Plan	Achieved	Y/N	Plan	Achieved	Y/N	Plan	Achieved	Y/N
1	Screed	Sqm	1200	1218	Y	1040	1025	Y	1040	1050	Y	1248	1250	Y	1320	1450	Y
2	False ceiling - Grid works	Sqm	1500	1479	N	1250	1250	N	1250	1210	N	1500	1510	Y	1560	1620	Y
3	Partition works	Sqm	120	121	N	100	98	Y	100	111	Y	120	150	Y	150	140	N
4	Painting works	Sqm	150	158	Y	150	145	N	150	151	Y	180	150	N	180	220	Y
5	Cladding works - Toilet	Sqm	180	191	Y	175	160	N	175	160	N	210	180	N	210	240	Y
6	Flooring works - Toilet	Sqm	240	211	N	200	195	N	200	200	Y	240	245	Y	240	173	N
7	Carpet works	Sqm	1440	1421	N	1200	1190	Y	1200	1240	Y	1440	1447	Y	1500	1750	Y
8	Workstation works	Nos	270	277	Y	250	245	Y	250	245	N	300	280	N	330	345	Y
PPC Calculation	No of Activities done				4			4			5			5			6
	Total No of Activities				8			8			8			8			8
	PPC %				50%			50%			63%			63%			75%

And they developed a PPC chart template in a somewhat different format, they had calculated only weekly PPC, they said they will not track on a daily basis. So they were tracking the performance on a weekly basis. For example, the PPC was ranging from 50 then going up to 75 percent.

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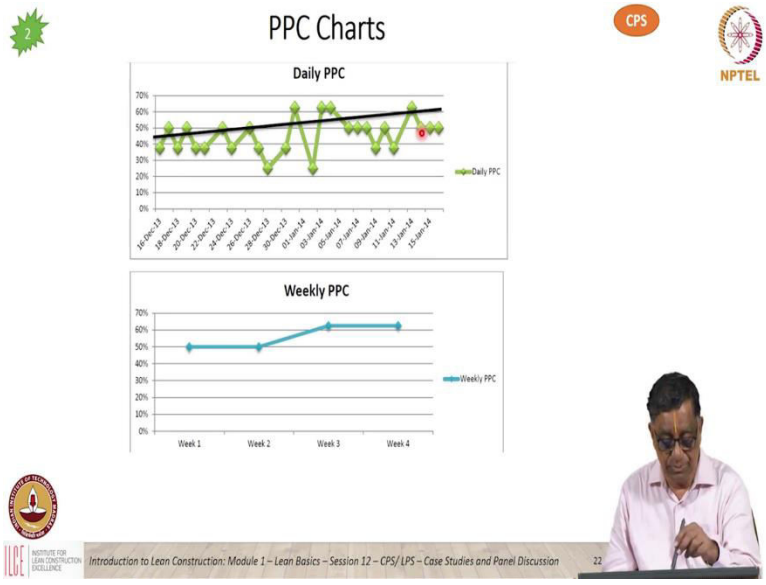

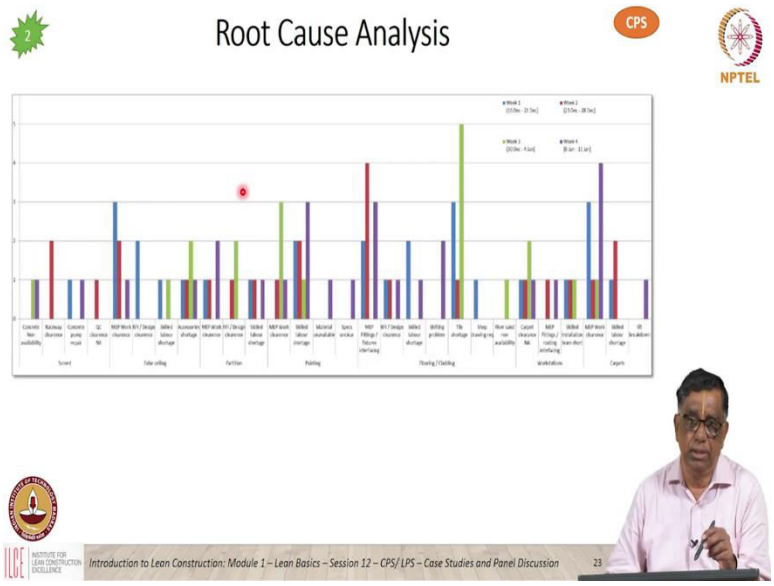

They were also plotting it like that, and the comforting thought was that the PPC was improving consistently on a monotonic basis. So, weekly PPC, and the daily PPC, sometimes they will actually calculate that to track the in between process, in between progress in between the week. A very good Root Cause Analysis system was put in place and they were keeping track of what was going wrong, what was preventing them from achieving high PPC and taking remedial measures. This particular concept was liked by all the side people trying to identify what was preventing them from good production and how to remedy that.

So, like I said, every organization has its own method of practicing lean, they may have different formats, they may have different intermediate processes. But the overall concept is same collaborative working, project as production system and continuous improvement. So, everyone liked the concept, and they are all progressing on the path of achieving better things by practicing lean.

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The third, is very important and very interesting project is a Jetty project in Dahej on the western coast by Afcons Infra, this was a large well spread-out project. So, the office was on land in one place and the entire jetty, people are working at different locations. So, they were not having many times, daily huddle. For example, was done on mobile phones, they all could not come to a single location, because some of them actually were at the Jetty head, which could be accessed only by boats.

So initially, they had a rollout program, involving all the people explain to them what is lean, how to practice it, and so on. And the daily huddle. These, what you see here was at the head of the Jetty in the site office, this was at the other location, this was sometime they had to stand together, and then talk for about 15-20 minutes and so on, depending on the time of the day. And the weekly process, review meeting again to the site office.

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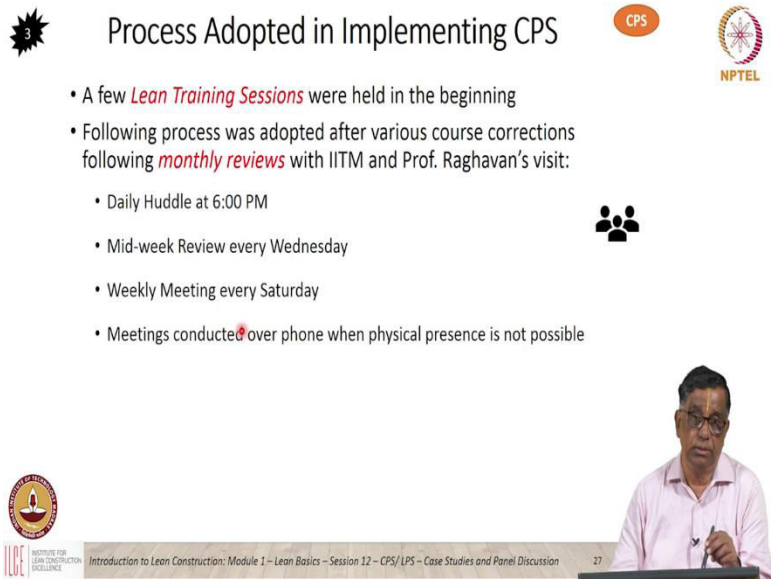

So, they had a few lean training sessions to get everybody on board in the same wavelength. Then they had the monthly reviews, IIT Madras was the main trainer at the time. And we used to go there frequently, or engage with them on online meetings, and tell them to get how to practice lean, what was going well, what not going well, correct all that.

So, they had a system of daily huddles every day at 6:00 PM. Midweek review on Wednesdays, weekends review on Saturdays, and then whenever not possible to meet in person, they used to have meetings on the phone itself, because the large site, too much spread out who they could not come together all the time.

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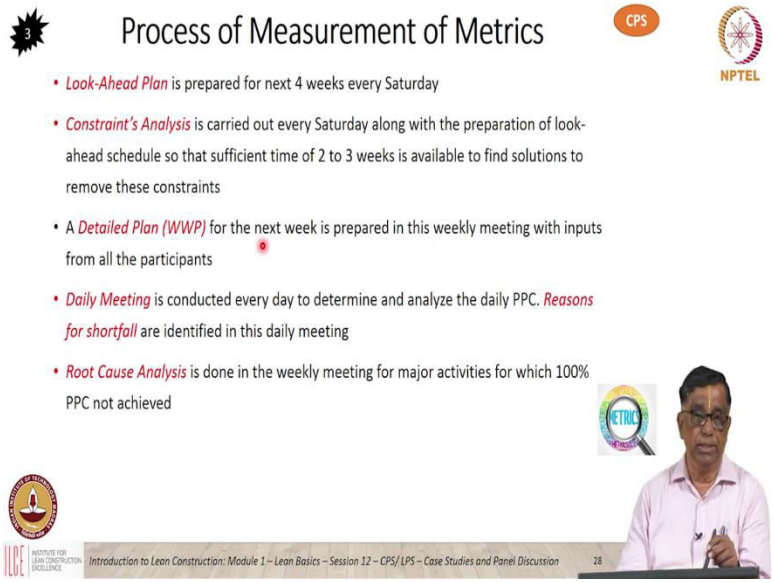

So, look ahead plan, they adopted a 4-week planning cycle, then constraint analysis was done every week on Saturdays. And that was very important, they realize a lot of benefits by doing that. And a detailed Weekly Work program again on Saturdays, and daily meeting agenda the day by daily huddle, and root cause analysis again, in the weekly meeting. They are quite systematic, but having their own formats.

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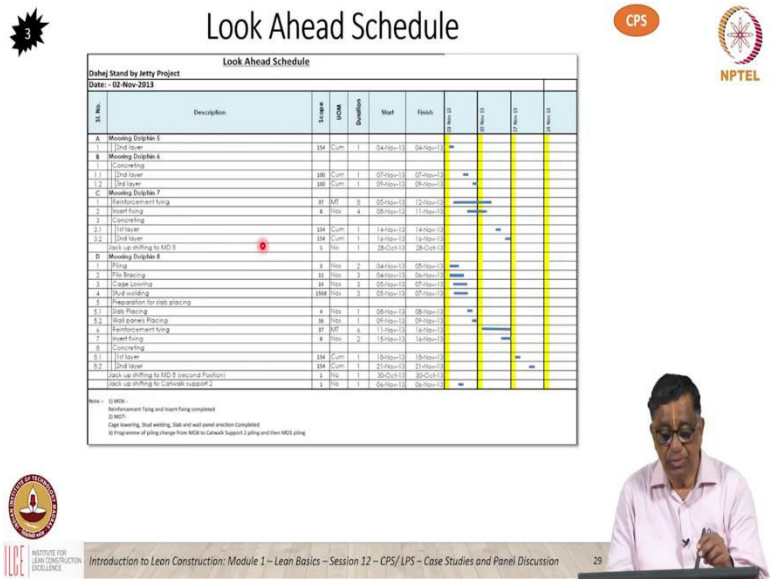

So, this is the typical look ahead schedule, what they made, including a bar chart like that, and a weekly work plan Monday through Saturday, and working on the PPC that way.

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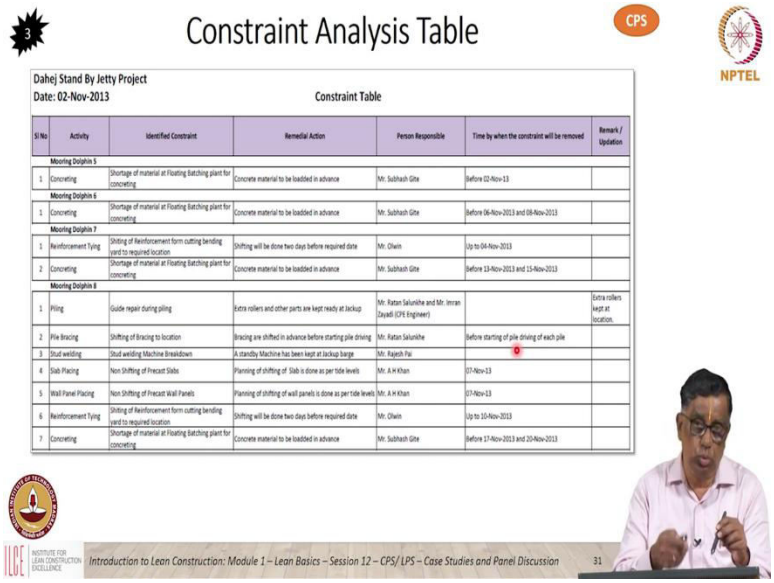

Sl No	Activity	Identified Constraint	Remedial Action	Person Responsible	Time by when the constraint will be removed	Remark / Updation
	Mooring Dolphin 5					
1	Concreting	Shortage of material at Floating Batching plant for concreting	Concrete material to be loadded in advance	Mr. Subhash Gite	Before 02-Nov-13	
	Mooring Dolphin 6					
1	Concreting	Shortage of material at Floating Batching plant for concreting	Concrete material to be loadded in advance	Mr. Subhash Gite	Before 06-Nov-2013 and 08-Nov-2013	
	Mooring Dolphin 7					
1	Reinforcement Tying	Shiting of Reinforcement form cutting bending yard to required location	Shifting will be done two days before required date	Mr. Olwin	Up to 04-Nov-2013	
2	Concreting	Shortage of material at Floating Batching plant for concreting	Concrete material to be loadded in advance	Mr. Subhash Gite	Before 13-Nov-2013 and 15-Nov-2013	
	Mooring Dolphin 8					
1	Piling	Guide repair during piling	Extra rollers and other parts are kept ready at Jackup	Mr. Ratan Salunkhe and Mr. Imran Zayadi (CPE Engineer)		Extra rollers kept at location.
2	Pile Bracing	Shifting of Bracing to location	Bracing are shifted in advance before starting pile driving	Mr. Ratan Salunkhe	Before starting of pile driving of each pile	
3	Stud welding	Stud welding Machine Breakdown	A standby Machine has been kept at Jackup barge	Mr. Rajesh Pai		
4	Slab Placing	Non Shifting of Precast Slabs	Planning of shifting of Slab is done as per tide levels	Mr. A H Khan	07-Nov-13	
5	Wall Panel Placing	Non Shifting of Precast Wall Panels	Planning of shifting of wall panels is done as per tide levels	Mr. A H Khan	07-Nov-13	
6	Reinforcement Tying	Shiting of Reinforcement form cutting bending yard to required location	Shifting will be done two days before required date	Mr. Olwin	Up to 10-Nov-2013	
7	Concreting	Shortage of material at Floating Batching plant for concreting	Concrete material to be loadded in advance	Mr. Subhash Gite	Before 17-Nov-2013 and 20-Nov-2013	

And the constraint analysis was very much liked by them. So, they look forward to identifying the constraints, how to resolve them, so that they do not get into problem at the last minute.

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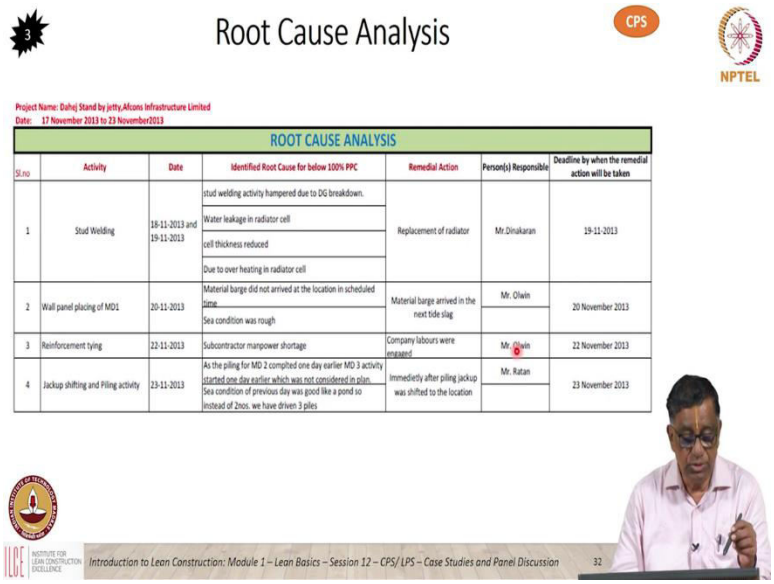
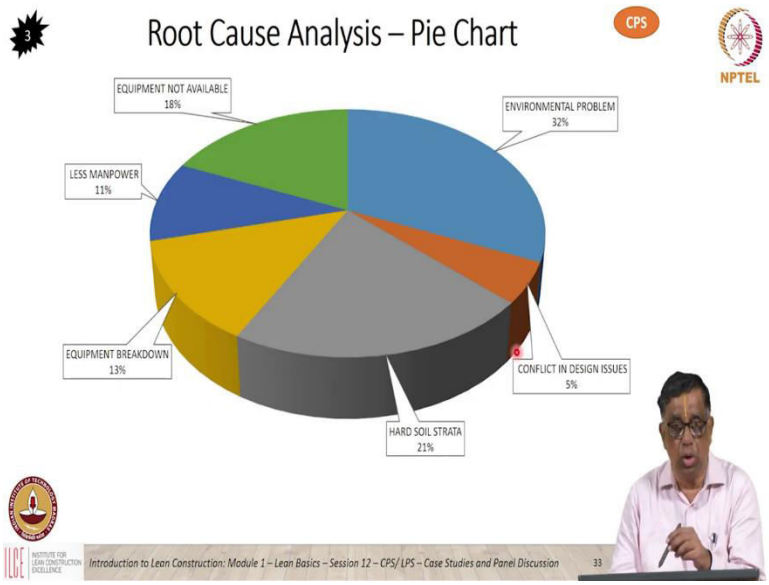


Sl.no	Activity	Date	Identified Root Cause for below 100% PPC	Remedial Action	Person(s) Responsible	Deadline by when the remedial action will be taken
1	Stud Welding	18-11-2013 and 19-11-2013	stud welding activity hampered due to DG breakdown. Water leakage in radiator cell cell thickness reduced Due to over heating in radiator cell	Replacement of radiator	Mr.Dinakaran	19-11-2013
2	Wall panel placing of MD1	20-11-2013	Material barge did not arrived at the location in scheduled time Sea condition was rough	Material barge arrived in the next tide slag	Mr. Olwin	20 November 2013
3	Reinforcement tying	22-11-2013	Subcontractor manpower shortage	Company labours were engaged	Mr. Olwin	22 November 2013
4	Jackup shifting and Piling activity	23-11-2013	As the piling for MD 2 compited one day earlier MD 3 activity started one day earlier which was not considered in plan. Sea condition of previous day was good like a pond so instead of 2nos. we have driven 3 piles	Immediatly after piling jackup was shifted to the location	Mr. Ratan	23 November 2013



Similarly, with root cause analysis, trying to find out what had gone wrong and remedying that.

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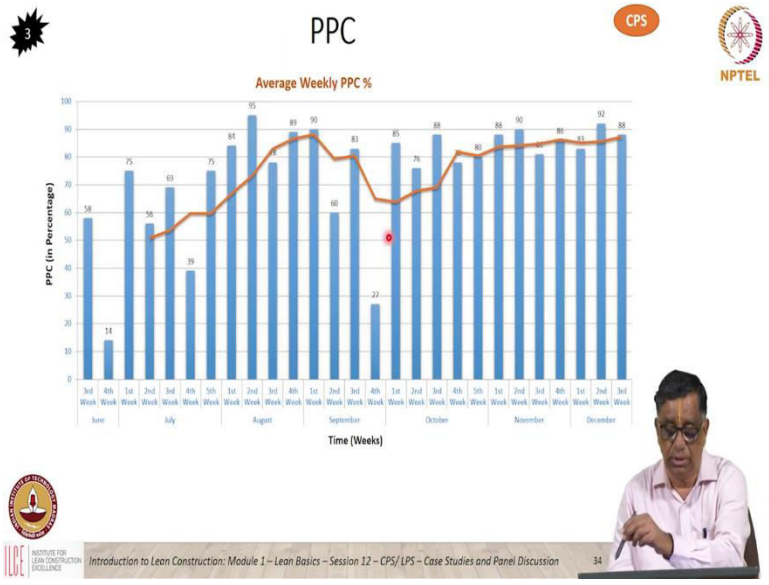

So, the PPC was increasing quite well monotonic basis more or less.

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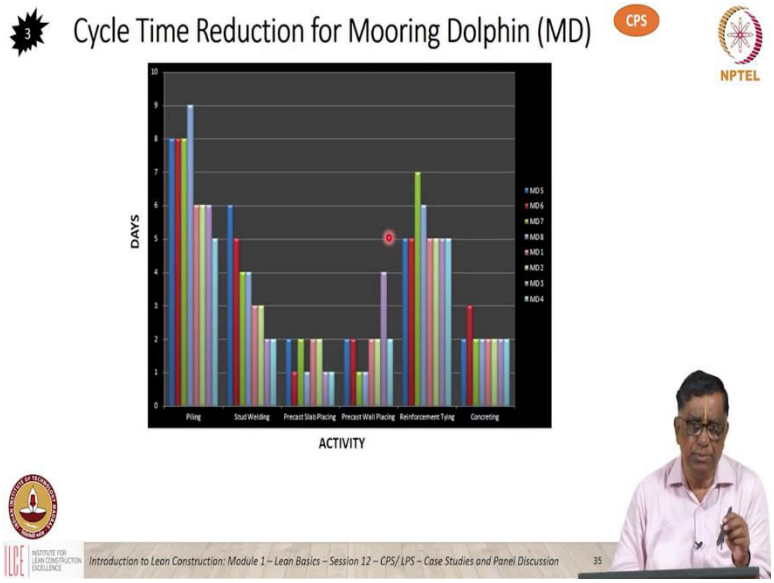

And another important concept they had was cycle time analysis. In the Jetty, as well as multistorey buildings, people were looking at cycle time, what are the cycle time from slab to slab for the multistorey building. And here they had a number of different caissons. So, for each case on the different color, they were tracking how they were progressing over time. So, very learning kind of environment.

I remember even the labor in their site, were coming up with good solutions. For example, the way the bars were bent, the bars were positioned, rebars in piles, the laborer came up with suggestions on how the pattern can be changed for easy production, improve productivity and for reducing the wastage. So the entire site was actually getting quite enthused, and they were coming up with number of suggestions for continuous improvement.

And overall, today, I must say that Afcons Infra are one of the very forward looking sites, looking organizations for practicing lean, and they have derived a number of benefits. And every time they are coming up with a different solution different format. For example, they are practicing something called choosing by advantages today and coming out with great benefits.

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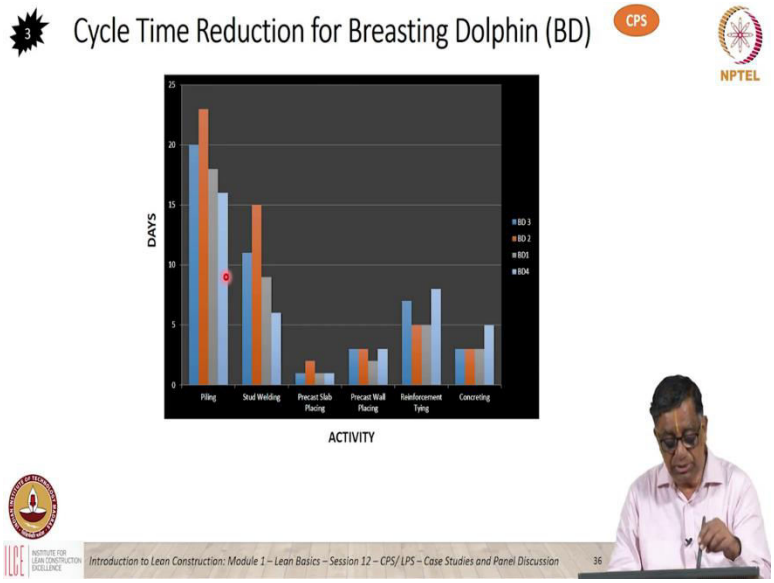

So, these are all cycle time analysis for the various works from time to time, and they had direct substantial benefits. So, we can go on and on and on with many, many different case studies. And you also can check out in the literature. We had actually for 4 or 5 conferences in India, on lean construction, in every conference there were so many papers and so many posters and all these are explaining how various kinds of, various organizations and projects are practicing lean.

And there are abundant number of case studies available to you in all these conference, literature and proceedings. So, do look at them, see for yourself and formulate your own methods and processes for your site or for your organization, and practice lean well and reap the benefits. All the best. Thank you.

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