

# Well Completions and Testing

S.Swarna Raju, SE(P),ONGC

# Well Completion

- Completions are the Interface between the reservoir and surface production.
- The role of a Completion Designer is to take a well that has been drilled and convert it into a safe and efficient production or Injection Conduit.
- Completion design involves a mix of Physics, Chemistry, Mathematics, Engineering, Geology, Hydraulics, Material Science, Practical hands on well site Experience.

# Completion Design

## SOR : Statement of Requirements

- Incorporates reservoir & production data
- Expectation of what the completion needs to achieve over the life of field

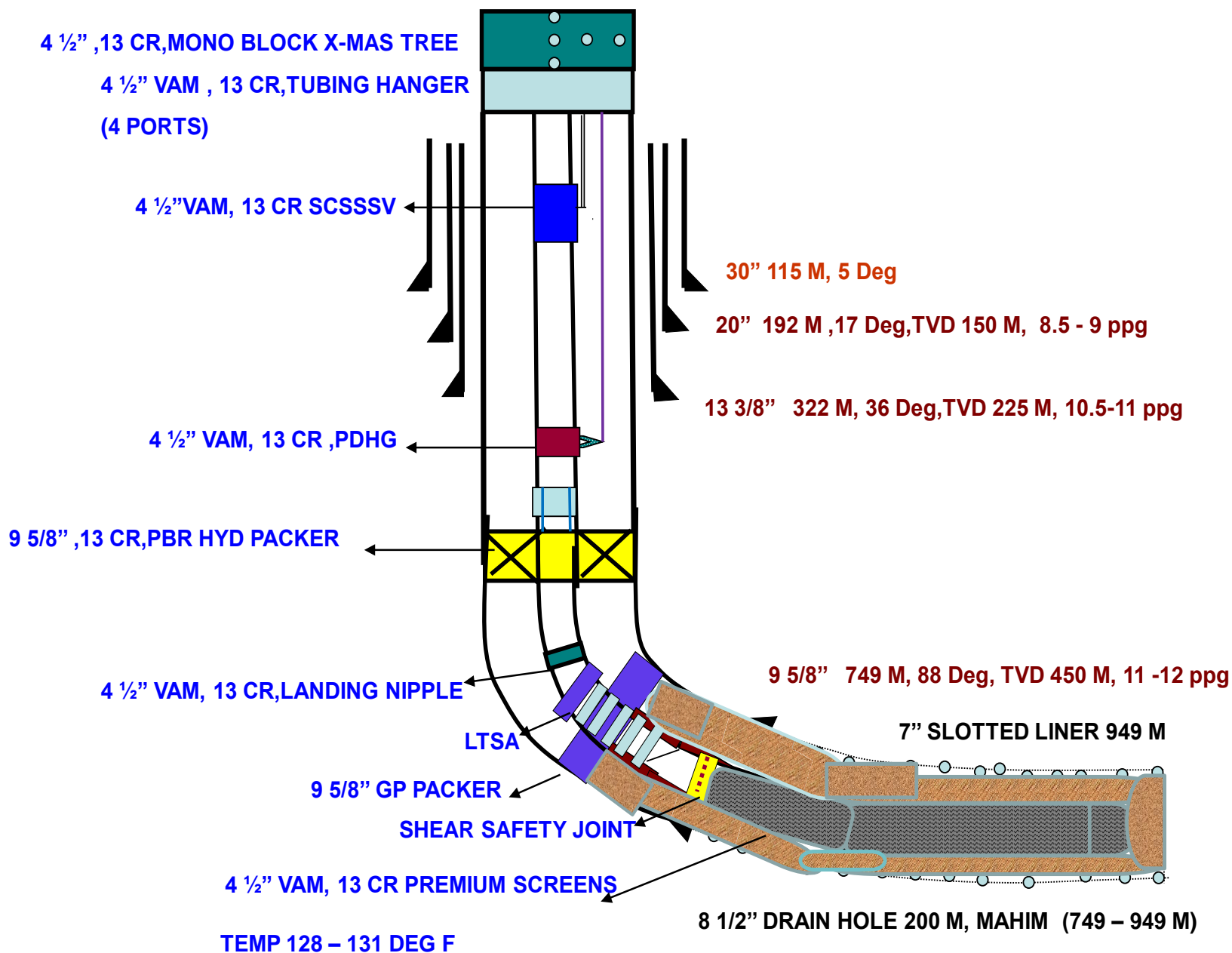
# Basis of Design

## Main Decisions

- Out Line
  - Sand Control, Stimulation
  - Tubing Size, Artificial Lift
- Detailed Design
  - Metallurgy, elastomers, tubing stress analysis, equipment analysis, & specifications
  - reviewed before purchase Of well head and trees.

- **Completion Procedures** : Received and agreed by all parties.
- **Post Completion Report** : States results, Schematic, S. No, Equipment and specifications, tubing tally, pressure test details, plots and summaries

# NORTH TATPI COMPLETION OPEN HOLE GRAVEL PACK



COMPLETION DIAGRAM

WELL C-24 P# 4 Z

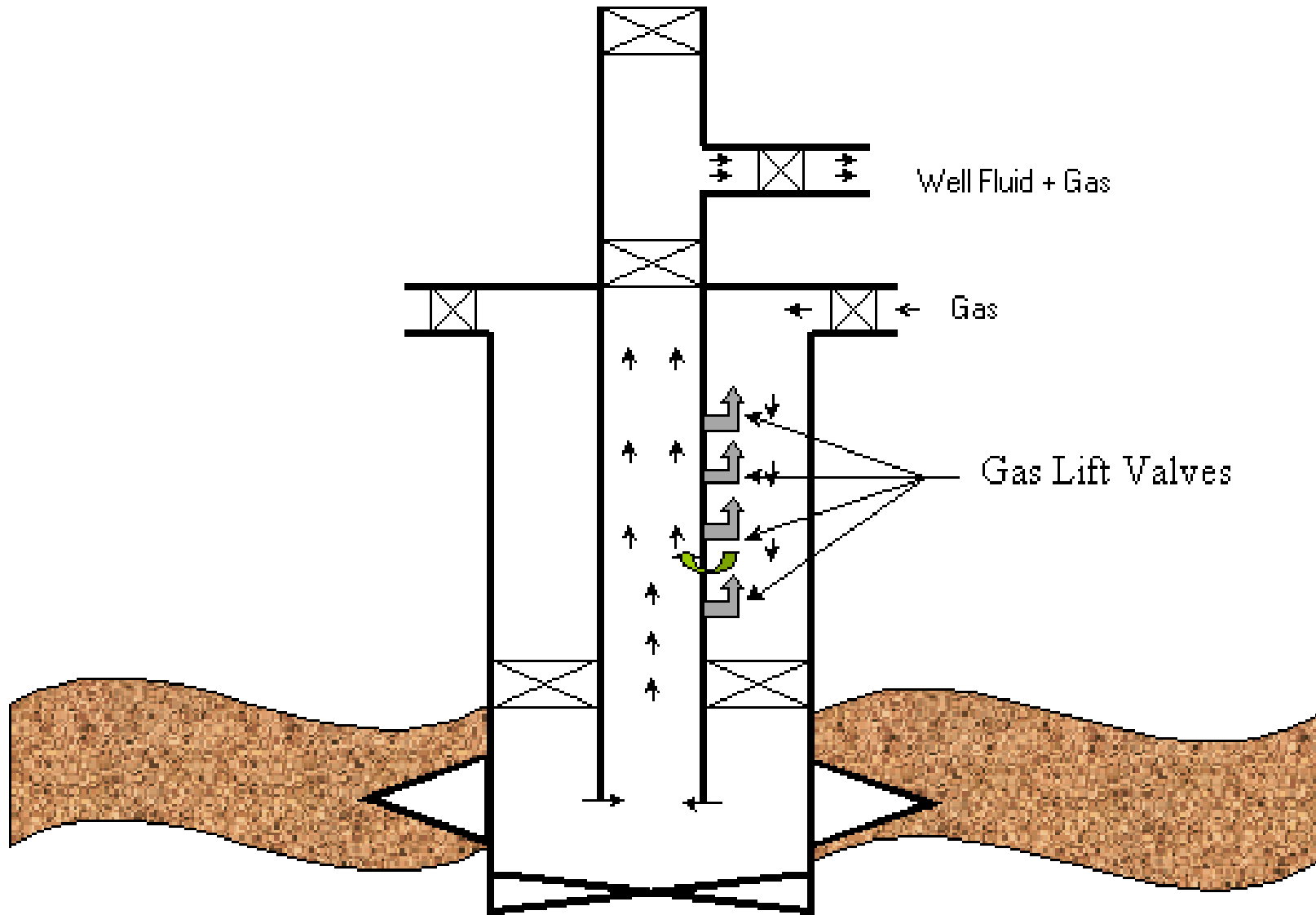
PLATFORM - C-24		RIG -- VIRTUE-1			DATE - 24.02.2011			
S.No	EQUIPMENT DETAILS	THREAD	LENGTH	ID - IN		DEPTH KB	ANGLE	
	<b>KB</b>		<b>19.82</b>					
1	T/H 31/2" VAM B X EUE B TOP	3.5" VAM	0.35	2.99				
2	X-OVER 31/2" NSCT B x VAM P		0.37	2.99				
3	PUP JOINTS - 2 NOS ( 1.80M ,1.81M)	3.5" NSCT	3.61	2.99				
4	TUBINGS 15 Nos	3.5" NSCT	141.36	2.99				
5	TUBING	3.5" NSCT	9.44	2.99		30"	150M	
6	X-OVER 31/2" NSCT B x VAM P		0.56	2.99				
7	FLOW COUPLING	3.5" VAM	1.15	2.99				
8	<b>SSSV 2.813 W/FORD (QN,S/EQ)</b>	<b>3.5" VAM</b>	<b>1.67</b>	<b>2.81</b>		<b>SSSV</b>	<b>176.66</b>	<b>6°</b>
9	FLOW COUPLING	3.5" VAM	1.15	2.99		20"	309M	11.5°
10	X-OVER 31/2" VAM B x NSCT P		0.55	2.99				
11	TUBINGS 403 Nos	3.5" NSCT	3794.35	2.99		13 3/8"	1758M	60°
12	X-OVER 31/2" NSCT B x VAM P		0.55	2.99		7"H/T	3353M	60.2°
13	<b>PBR (BAKER)</b>	<b>3.5" VAM</b>	<b>10.03</b>	<b>2.99</b>		<b>PBR</b>	<b>3974.93</b>	<b>41.26°</b>
14	X-OVER 31/2" VAM B x NSCT P		0.55	2.99		9 5/8"	3860M	47°
15	TUBING	3.5" NSCT	9.38	2.99				
16	X-OVER 31/2" NSCT B x VAM P		0.55	2.99				
17	<b>LATCH</b>	<b>3.5" VAM</b>	<b>0.74</b>	<b>2.99</b>				
18	<b>HYD.PACKER (BAKER, SC2-PHA)</b>	<b>3.5" VAM X 7"</b>	<b>1.95</b>	<b>2.99</b>		<b>PACKER</b>	<b>3996.18</b>	<b>47°</b>
19	X-OVER 31/2" VAM B x NSCT P		0.55	2.99				
20	TUBING	3.5" NSCT	9.33	2.99				
21	X-OVER 31/2" NSCT B x VAM P		0.55	2.99				
22	<b>L/ NIPPLE- XN PARVEEN (NO60 2.75")</b>	<b>3.5" VAM</b>	<b>0.36</b>	<b>2.62</b>		<b>L/N</b>	<b>4008.56</b>	<b>41.25°</b>
23	X-OVER 31/2" VAM B x NSCT P		0.55	2.99				
24	TUBING	3.5" NSCT	9.34	2.99				
25	X-OVER 31/2" NSCT B X VAM P		0.50	2.99				
26	X-OVER 31/2" VAM B X FOX P		0.38	2.99				
27	<b>HYDRO TRIP SUB (BOTIL)</b>	<b>3.5" FOX</b>	<b>0.43</b>	<b>2.99</b>		<b>H/SUB</b>	<b>4019.69</b>	<b>41.3°</b>
28	FOX TUBING	3.5" FOX	9.65	2.99				
29	X-OVER 31/2" FOX B x VAM P		0.38	2.99				
30	<b>SEAL ASSY ( Total length 4.73M)</b>	<b>3.5" VAM</b>	<b>0.26</b>	<b>2.99</b>			<b>4030.41</b>	
31	<b>GP PACKER (SC-2,BAKER)</b>	<b>7"</b>	<b>1.45</b>	<b>4</b>		<b>GP PKR.</b>	<b>4030.5</b>	<b>41.5°</b>
32	PACKER PORTED EXTENSION		2.41	4				
33	BLANK EXTENSION	3.5" VAM	5	4.28				
34	SHEAR OUT SAFETY JT ( BAKER)	3.5" VAM	0.96	3				
35	BLANK PIPE	3.5" VAM	9.56	2.99				
36	BLANK PIPE	3.5" VAM	9.49	2.99				
37	BLANK PIPE	3.5" VAM	9.37	2.99				
38	PREMIUM POROMAX SCREEN(250 M)	3.5" VAM	9.23	2.99				
39	PREMIUM POROMAX SCREEN(250M)	3.5" VAM	9.23	2.99				
40	PREMIUM POROMAX SCREEN (250M)	3.5" VAM	9.23	2.99				
41	PREMIUM POROMAX SCREEN(250M)	3.5" VAM	9.23	2.99				
42	BULL PLUG	3.5" VAM	0.31	2.99				
						<b>6" OPEN HOLE</b>		
						<b>4070 M TO 4106M</b>		
						<b>(36 M) IN SAND-</b>		
						<b>40</b>		
						<b>TD 4106 M</b>		<b>42°</b>



# COMPLETION DIAGRAM OF WELL NO : EC # 5

RIG : S/KIRAN		DATE : 27.10.11	KB =	16.55	
EQUIPMENTS	LENGTH	DIAGRAM	DEPTH FR TH	DEPTH FR KB	GENERAL
3 E T/H BHEL	0.35			16.55	<b>CASING DETAILS:</b>
3E Tubing 15 Nos	140.43				30" CSG SHOE: 154 M
3E Tubing	9.5				20" CSG SHOE: 294 M
3E FC (Paraveen)	1.16				13 3/8" CSG SHOE: 1325 M
3E SSSV (W/FORD)	1.69		151.44	167.99	9 5/8" CSG SHOE: 1789 M
3E FC (Paraveen)	1.16				7" HANGER TOP : 1636.68M
3E Tubing 61 Nos	572.92				7" LINER SHOE : 1938 M
3E Tubing	9.14				
3E MMG-I (Weatherford)	2.62		736.35	752.9	
3E Tubing 70 Nos	650.06				<b>CLEAR DEPTH : 1913 M</b>
3E Tubing	9.37				
3E MMG-II (Weatherford)	2.62		1398.4	1414.95	<b>COMPLETION FLUID: 8.6 PPG BRINE</b>
3E Tubing 39 Nos	365.28				<b>X-MAS TREE : 3 1/8" BHEL OLD TESTED</b>
3E Tubing	9.4				
3E MMG-III (Weatherford)	2.62		1775.7	1792.25	<b>L/N : XN - 2.75" PARVEEN</b>
3E Tubing	9.5				
3E X 7" HYD PKR (BOTIL)	2.2		1787.82	1804.37	<b>MAX DEVIATION : 52°</b>
3E Tubing	9.39				
3E L/N PRAVEEN	0.35		1799.41	1815.96	<b>SSSV : SIZE-3 1/2" X ID 2.81"</b>
3E Tubing	9.4				<b>MAKE- WEATHERFORD</b>
3E POP (BOTIL)	0.24	1809.4	1825.95	<b>PROFILE --QN WPE-5</b>	
<b>Perforation details</b>					
L-III LAYER					
1851-1853.5 M					
1875-1878 M					





Conventional Gas Lift

# Well Testing

- All the wells must be tested (sometimes for a short time) in order to ascertain production (or injection) index and any possible damage.
- Well Testing often performed with temporary assemblies.

# Purpose of Well Testing

- To determine the ability of formation to produce reservoir fluids.
- To determine the underlying reason for a well's productivity.

A properly designed, executed and analyzed well test gives information

- Formation Permeability
- Extent of well bore damage or stimulation
- Reservoir pressure boundaries and heterogeneities

# Testing process stages

- Create a pressure draw down
- Well fluids entering into Well bore
- Flow the well and measure flow rate
- Shut in the well and again flow
- Recording flowing Pressures and shut in pressures