

# **U.T. of Jammu & Kashmir**

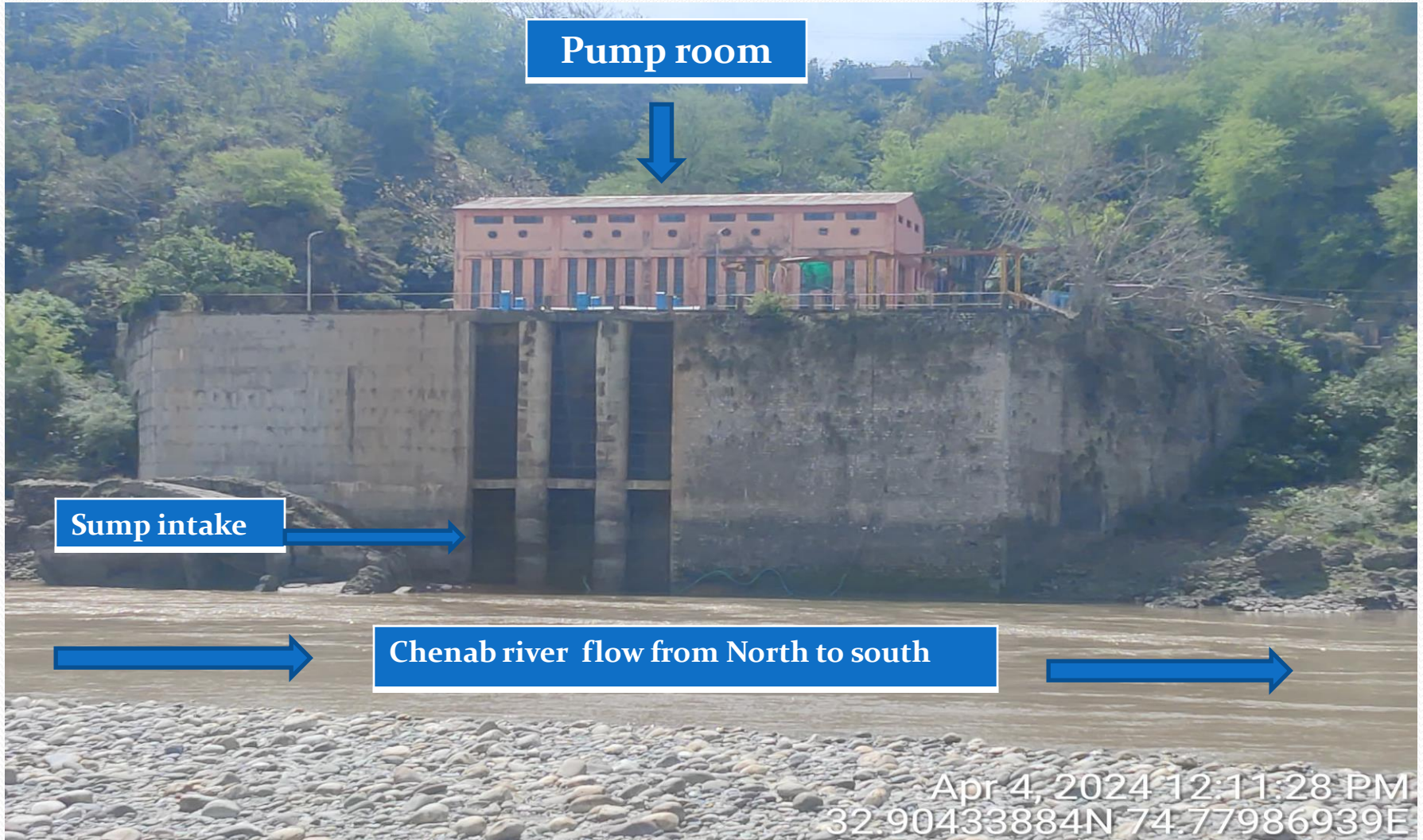
## **JAL SHAKTI DEPARTMENT**

**INSTALLATION OF HEAVY DUTY WEAR  
RESISTANT SLURRY PUMP WITH  
IMPROVED METALLURGY AT LIS  
RANJAN**

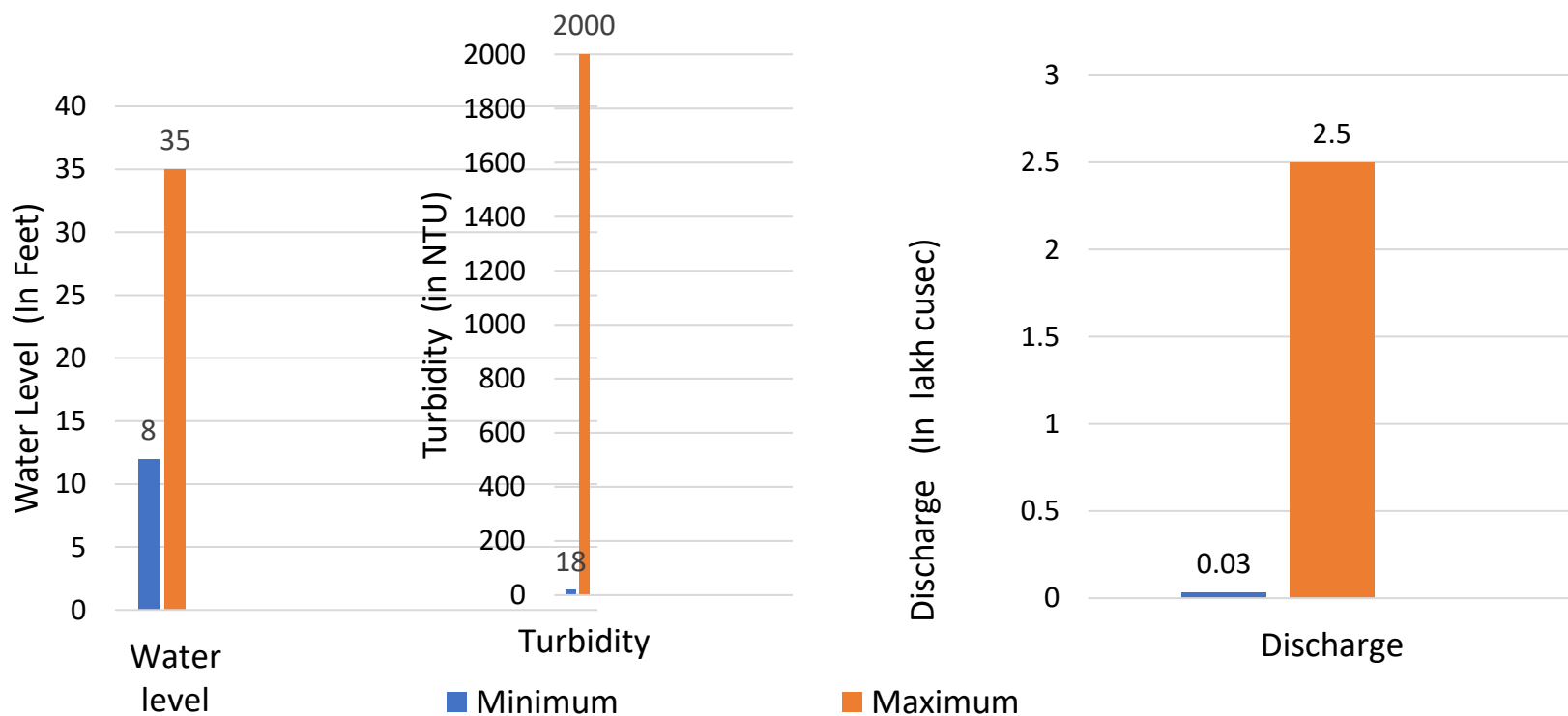
**PRESENTED BY –Ajay sharma Executive Engineer**

- **MECHANICAL IRRIGATION DIVISION  
AKHNOOR/ NOWSHERA**

# LIS RANJAN



# Graphic Representation of variation in Water Level, Turbidity and Discharge of River Chenab during lean season and floods in a year.



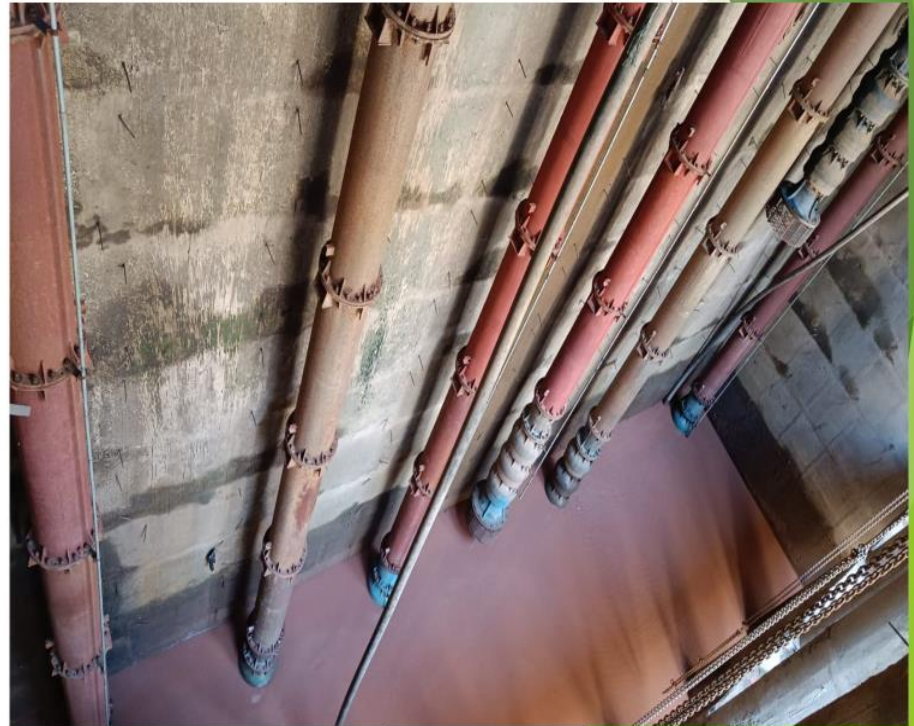
## MACHINERY INSTALLED AT LIS RANJAN YEAR: 1988

VT Pumps ( 07 Nos.) (5+2 standby)	: 20 cusecs 61 M Head With
	: minimum submergence 1.78 M
Prime Mover (07 Nos.)	: 650 HP/485 KW,
HT Panels ( 12 Nos.)	: 2 I/C, 2 Aux., 1 BBC, 7 O/G
Starters (07 Nos.)	: Liquid Resistance Starter
HT receiving station	: 33/6.6 kV
Automatic Voltage Regulator	: 6.6 kV ... 02 Nos.
Rising Mains	: 900 mm MS

# PUMPING UNITS IN PUMPING HOUSE

650 HP HT MOTOR  
PUMP SET BELOW

SUCTION COLUMN PIPES



# SILT DEPOSITION IN SUMP



# Embedded Bowl Assemblies



## REASONS OF SILT DEPOSITION AT LIS RANJAN

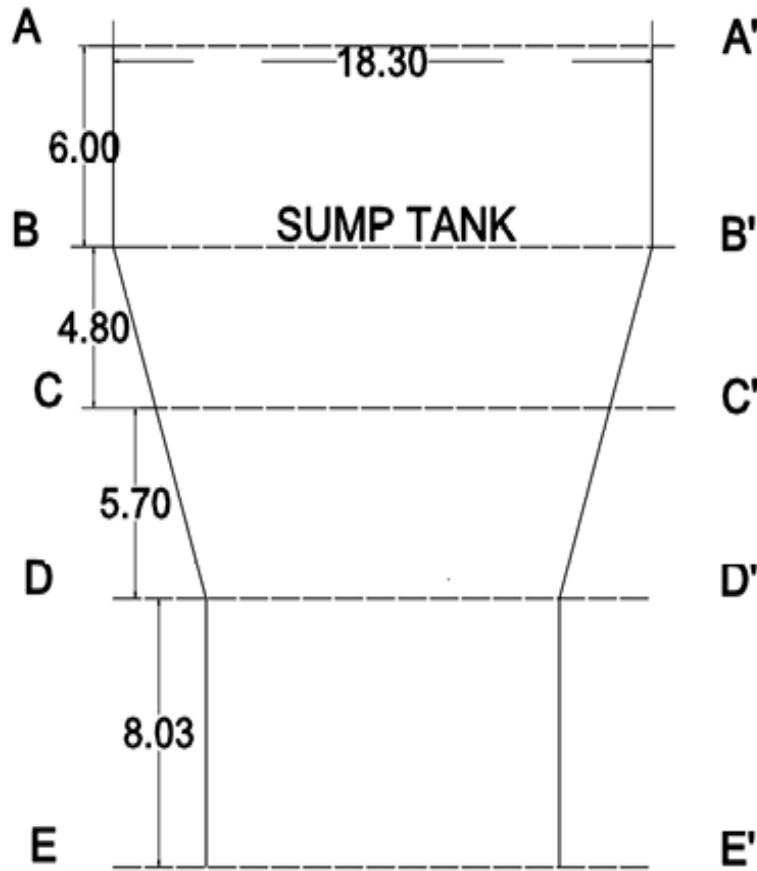
- Huge variation in turbidity of Chenab.
- Every flood brings silt which comes in sump.
- Silt ejection is a regular phenomenon at run of river hydroelectric projects.
- Gates cannot be closed during minor /average floods due to demand of farmers.
- Silt cannot be removed from sump except in month of Jan./ Feb. when water level is leanest.
- Solidification of silt in period of one year needs power hammer for breaking.



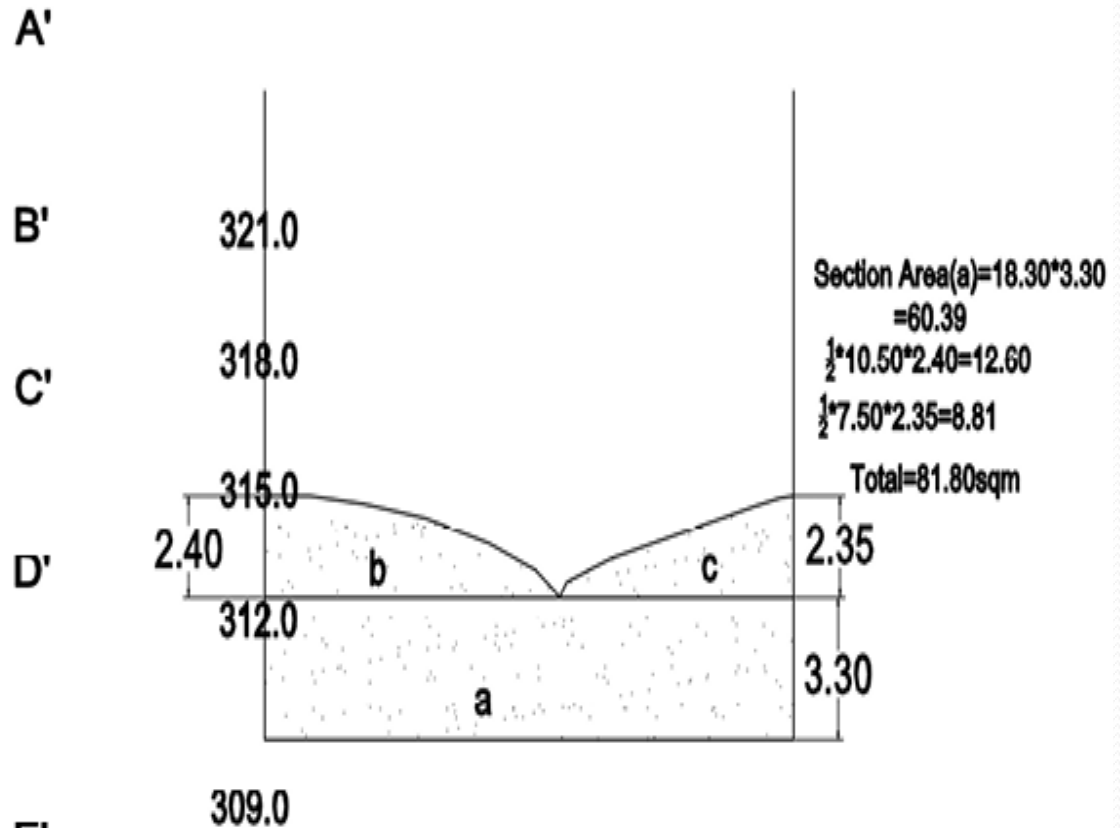
## MACHINERY OPERATIONAL ISSUES DUE TO SILT ACCUMULATION

- Impellers/ mouth of Bowl assemblies gets embedded in silt.
- water column at inlet less than min. submergence thus cavitation.
- Excess wear of bowl and impeller veins due to abrasive material in silt.
- Specific gravity of silted water increases and thus more load on the pumps.
- Shear failure of 70 mm solid diameter stainless steel shafts due to high thrust load.

# DETAILED CROSS-SECTION OF SUMP FOR DESILTING AT RANJAN CANAL HEADWORKS

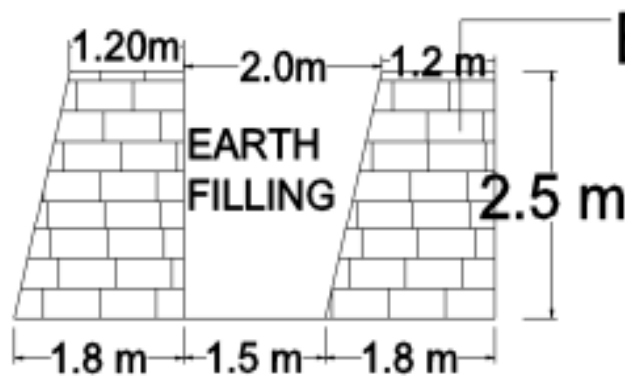


**PLAN**



**SECTION AT BB'**

# PREPARATION FOR MANUAL DESILTING OF SUMP AT RANJAN CANAL HEADWORKS



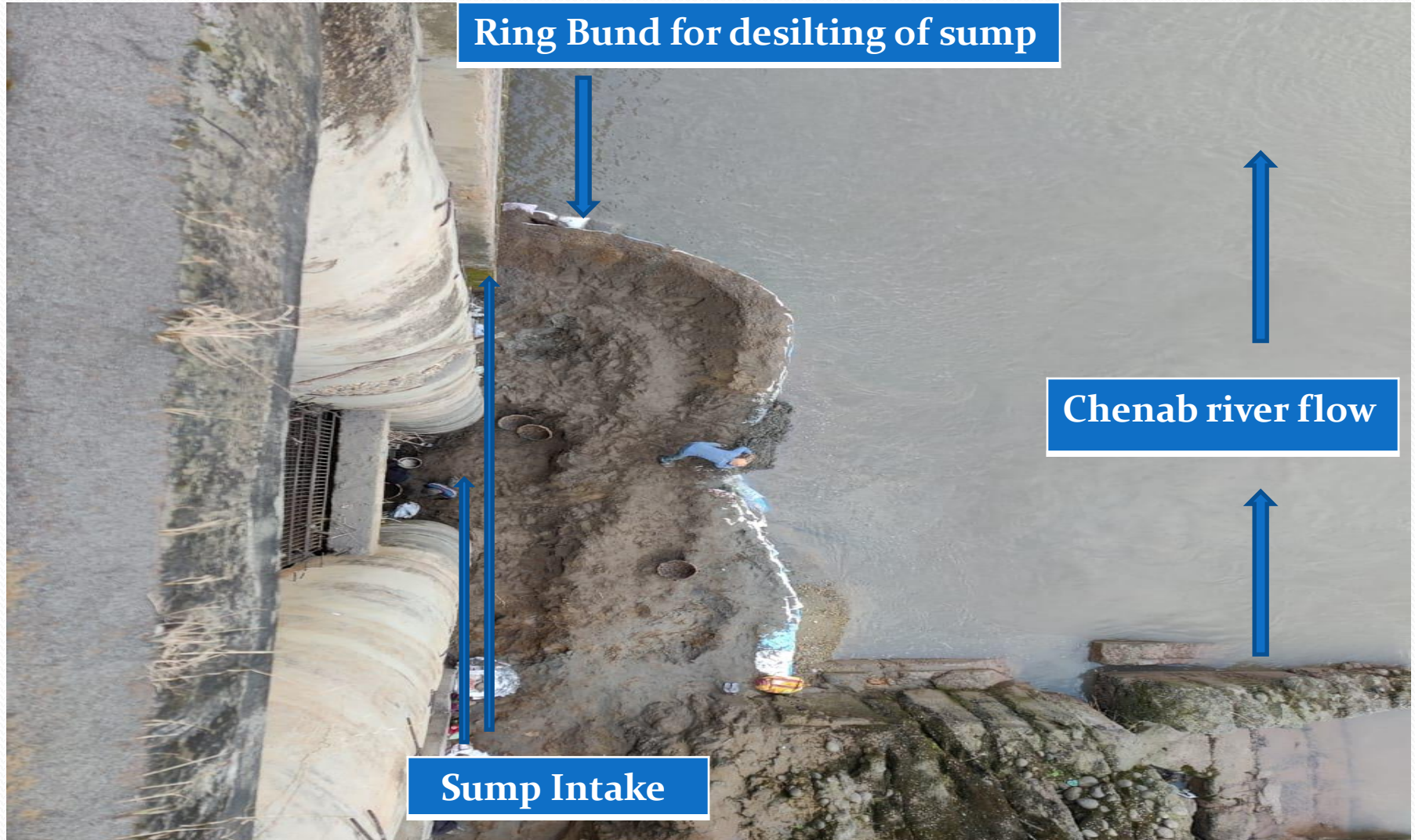
E.C BAGS

$$S.A = 2 \times 1.2 + 1.8/2 \times 2.5 \times 25$$

$$= 187.5 \text{ cum.}$$


EARTHEN  
BUND AVG.  
LENGTH=25M

# RING BUND CONSTRUCTION DURING LEANEST DISCHARGE FOR MANUAL SILT CLEARANCE



# DESILTING USING MANUAL LABOUR AT LIS RANJAN





Latitude: 32.917526  
Longitude: 74.789112  
Accuracy: 2600.0m  
Time: 26-02-2024 11:38

## WAY FORWARD

- To overcome these issues and ensure safe operation of the pumping machinery at the optimum capacity, silt clearance needs to be made a **continuous** phenomenon.
- To achieve this a slurry pump of 15 m head with 10.8 kW motor, shut off head 24 meter, maximum discharge 3.25 cubic m/min of highly wear resistant material be utilized.
- The readily available slurry pumps in the market do not meet the metallurgical requirement for this job.
- The pump in the following slides was selected.
- The procedure made the whole process economical and easier.

# WAY FORWARD

- **TEXMO BRAND TUSURUMI MAKE PUMP ZEROED IN DUE TO.**
  - a) Most durable components to cater to abrasion.
    - (i) High Chromium white cast Iron Impellers ( HCWCI).
    - (ii) Silicon Carbide Double Mechanical seals .
    - (iii) Pumps being used both in open and submerged condition having internal cooling arrangement.
    - (iv) Stainless steel EN- X 30 Cr13.
    - (v) HCWCI is hard machineable material with rigid and hard microstructure.
    - (vi) 10.8 KW motor, slurry pump 15 m head, shut off head 24 meter, maximum discharge 3.25 cubic meter/minute.

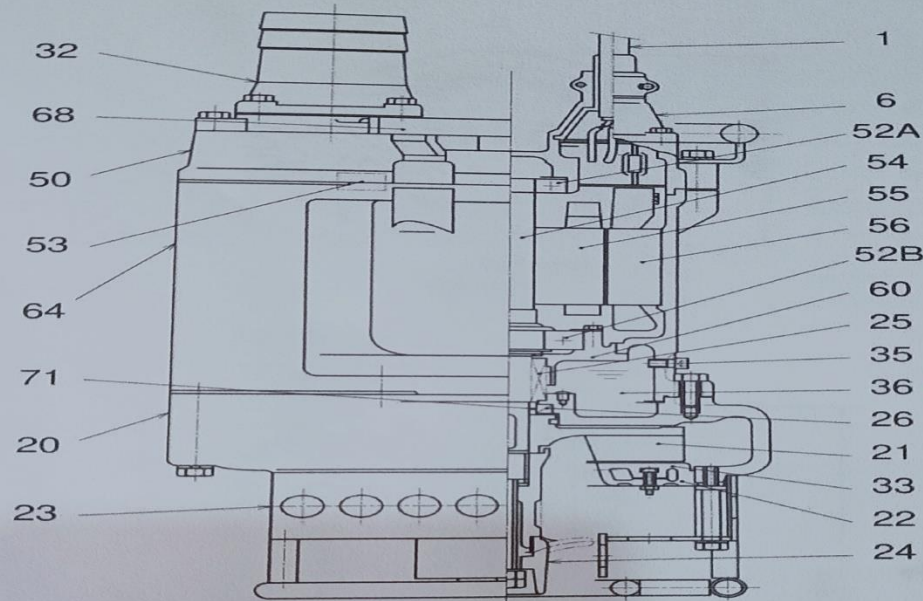


# SLURRY PUMP



# SECTIONAL DIAGRAM

**Sectional Drawing  
KRS2-150**



For Global Engineering Works  
Prop



**KRS2-150**

No.	Description	Qty.	Remarks	No.	Description	Qty.	Remarks
1	Cable	1	20m H07RN-F 4Cx4mm <sup>2</sup>	52A	Upper Bearing	1	6307ZZC3
6	Stuffing Box	1	FC200 (EN-GJL-200)	52B	Lower Bearing	1	6310ZZC3
20	Pump Casing	1	FC200 (EN-GJL-200)	53	Motor Protector	1	
21	Impeller	1	Chromium Iron Casting	54	Shaft	1	SUS420J2 (EN-X30Cr13)
22	Suction Cover	1	FC200 (EN-GJL-200)	55	Rotor	1	
23	Strainer Stand	1	Steel Plate / Steel Pipe	56	Stator Complete	1	
24	Agitator	1	Chromium Iron Casting	60	Bearing Housing	1	FC150 (EN-GJL-150)
25	Mechanical Seal	1	H-35	64	Motor Frame	1	FC150 (EN-GJL-150)
26	Oil Seal	1	DD-406211	68	Handle	1	Galvanized Steel Pipe
32	Hose Coupling	1	FC200 (EN-GJL-200)	71	Shaft Sleeve	1	SUS403 (EN-X6Cr13)
33	Suction Plate	1	Chromium Iron Casting				
35	Oil Plug	1	SUS304 (EN-X5CrNi18-10)				
36	Lubricant		Turbine Oil (ISO VG32)				
50	Motor Bracket	1	FC150 (EN-GJL-150)				

# EXECUTION OF WORK

- Lowering of slurry pump in the sump and movement along two axis.

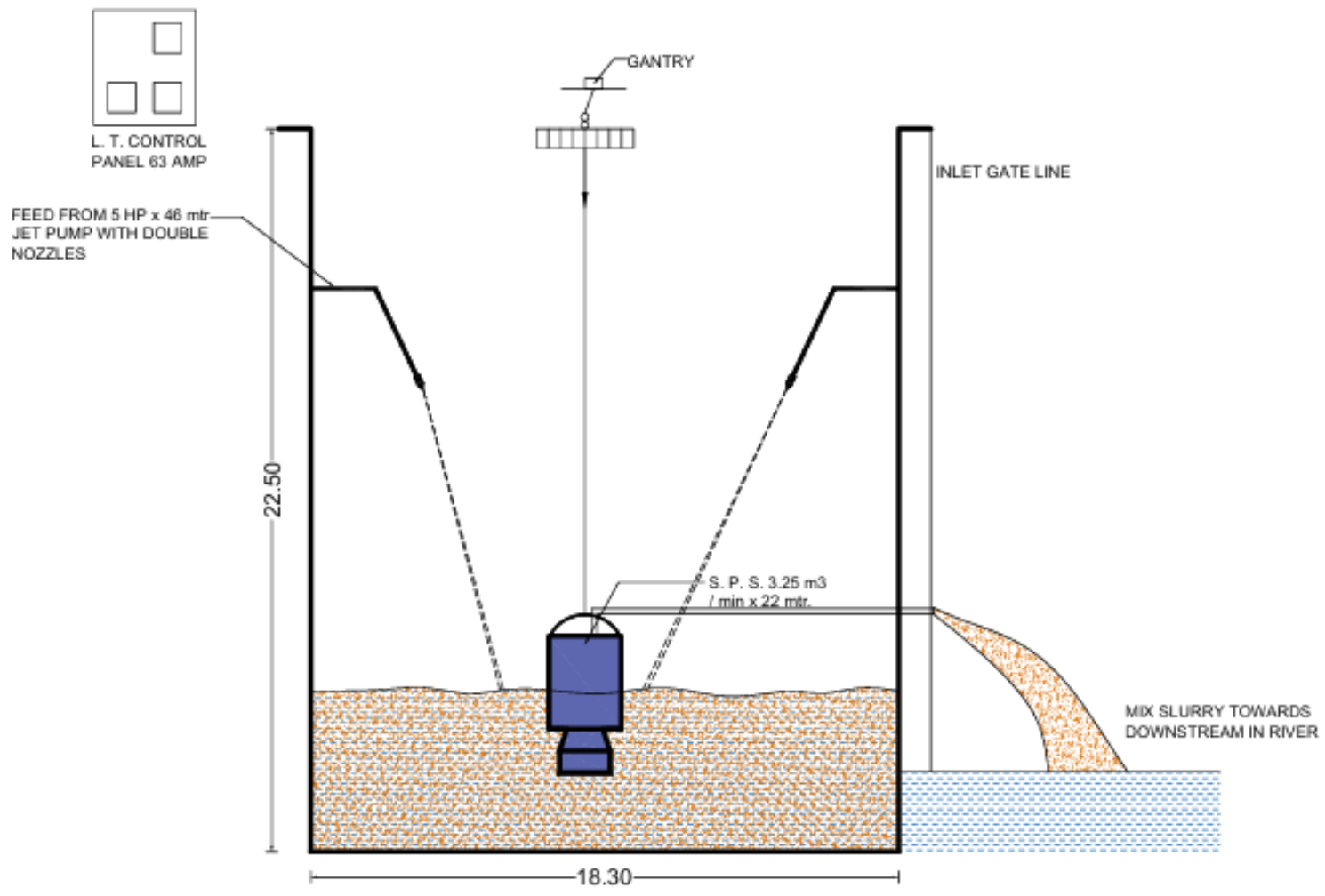


## MODIFICATIONS INCORPORATED IN THE WORKING MECHANISM OF SLURRY PUMP TO IMPROVE ITS EFFICIENCY FOR DESILTING

High pressure water jet cutting method introduced to breakdown the silt in slurry form.



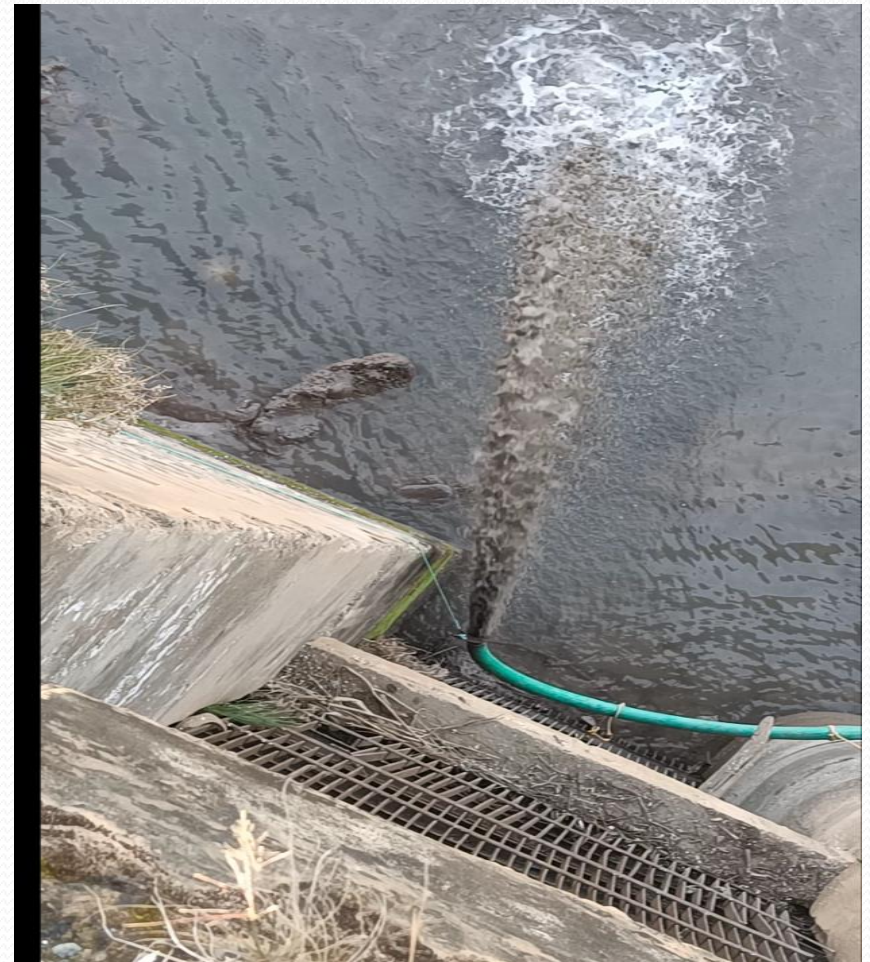
# LINE DIAGRAM OF DESILTING MECHANISM



5HP Capacity 46m Head Jet pump coupled with dual nozzles incorporated in the design for formation of slurry.



# WATER JET CUTTING TO BREAKDOWN SEDIMENTED SILT IN THE SUMP TO MAKE SLURRY



# FINANCIAL IMPLICATION FOR INSATLLATION OF SLURRY PUMP AT LIS RANJAN

S. No.	Description	Qty	Rate Rs(in lacs)	Amt. Rs(in lacs)
1.	Cost of Pump and Motor 12.5 Hp x 24 mtr head 3.5 m <sup>3</sup> / min discharge	01	5.22	5.22
2.	Cost of 05HP Jet pump x 46 mtrs with pipes, Nozzles and fittings	01	0.70	0.70
3.	Automatic Panel 12.5 HP with internal & external wiring	01	0.50	0.50
4.	Assembly, Lowering, Commissioning, Testing and P/F of accessories/GI fittings	01 job	0.30	0.30
5.	Labour Cost	01 job	0.33	0.33
		Total	7.05	7.05
		Firm's profit @ 10%		0.70
		Net		7.75
		GST @18% + 02% i. tax		1.55
		G. Total		9.30



# BENEFITS/SUGGESTIONS

- Effective silt clearance from sump throughout the year.
- Reduction in the manpower.
- Economy of Operation by avoiding Ring bund.
- Improvement in operation of VT Pumps and life of shafts.
- Increased output/discharge of VT Pumps.
- More CCA.

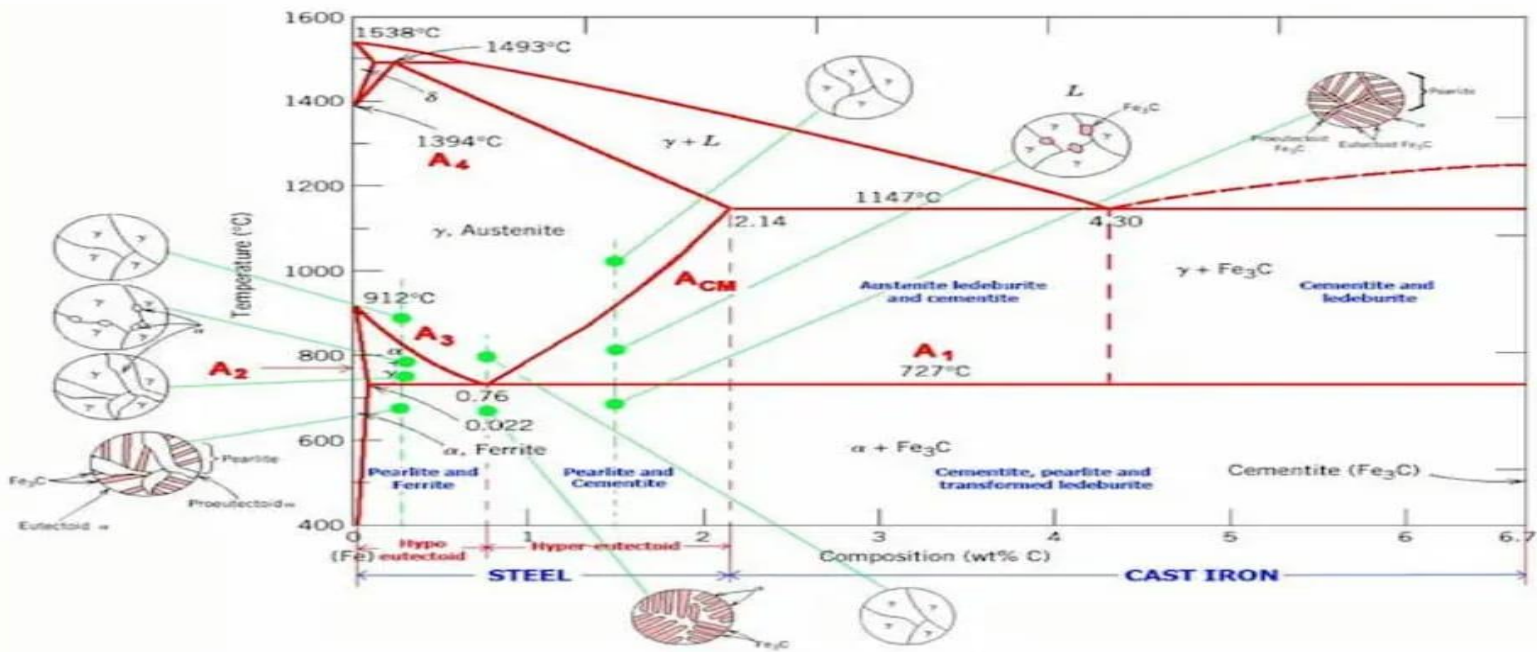
# SUCCESSFUL OPERATION OF SLUDGE PUMP AT LIS RANJAN





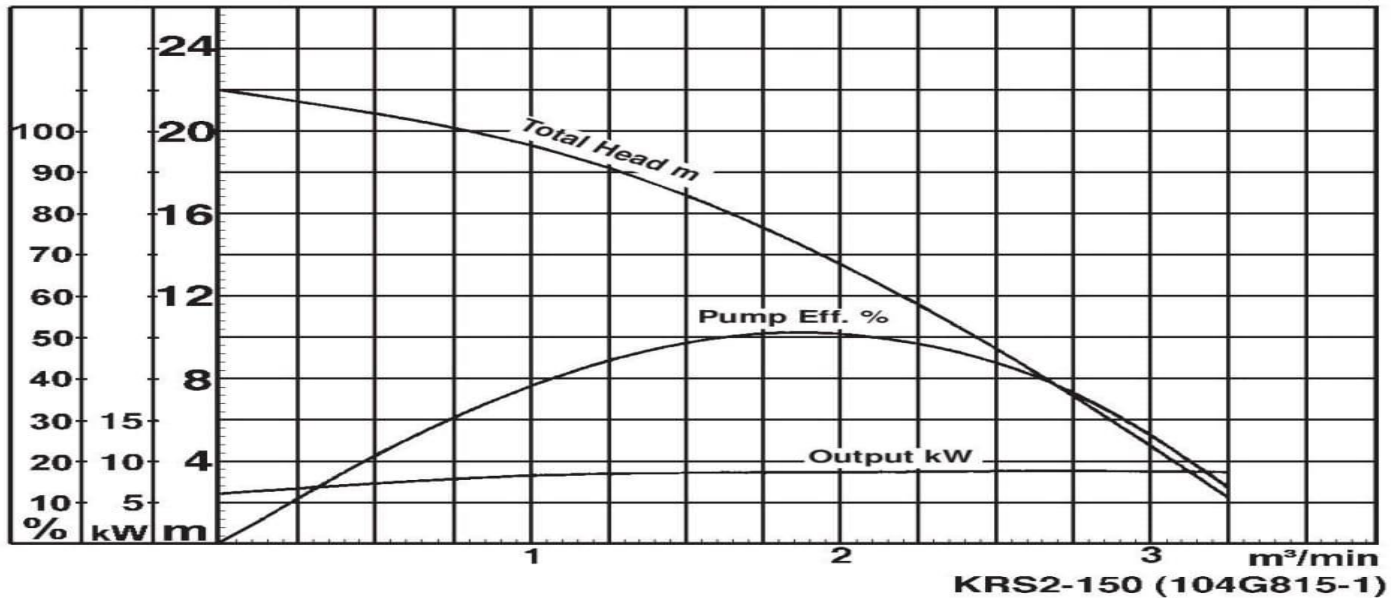
*THANK YOU*

# Iron-Carbon Phase Diagram



## Pump Performance Curve KRS2-150

Discharge Bore	150 mm
Total Head	15,0/8,0 m
Capacity	1,8/2,5 m <sup>3</sup> /min
Motor Output	9,0 kW
Motor Input	10,8 kW
Phase	3
Voltage	400 V
Frequency	50 Hz
Rated Current	18,5 A
Starting Current	155,0 A
Poles	4
Revolution	S.S. 1450 r.p.m.
Starting Method	direct on line
Insulation Class	B



## Comparison of Metallurgy of Materials used in pumps

	White Cast Iron	Grey Cast Iron	High carbon Steel
Carbon	4.3% - 6.7% *	2.5% - 4%	<2%
Chromium	23% - 28%	-	11.3% - 12.5%
Brinell Hardness	375 - 600	149 - 320	300
Tensile Strength	140 - 180 kg/mm <sup>2</sup>	15 - 40kg/mm <sup>2</sup>	1
Machinability	Very Difficult	Easy	Easy
Best for use	Pump impellers lining in wear resistant conditions	Clear water with less silt	Clear water with pH value > 7.4 with less silt
Micro Structure	Cementite, Pearlite, Ledeburite	Ferrite & Pearlite	Alloy Material
Structure Type	FCC	BCC	--
Heat Treatment	Quenching with tempering cooling instantly at controlled temperature	Natural cooling	Defined with every micro structure

\* Hypo-eutectic 2.5% - 4.3% Carbon  
 Hyper-eutectic 4.3% - 6.7% Carbon