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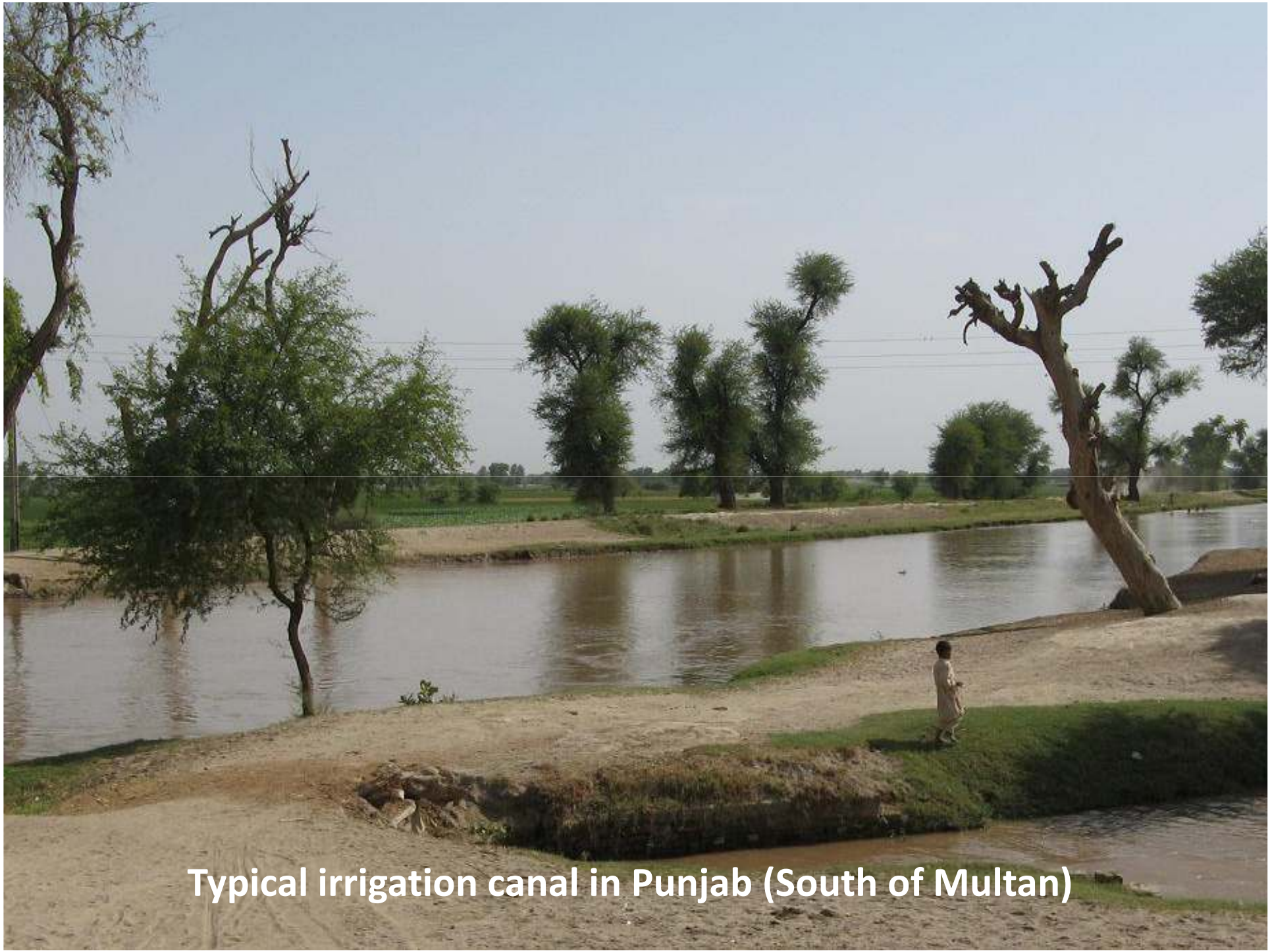
TUBEWELL EFFICIENCY IMPROVEMENT PROJECT (TWEIP)

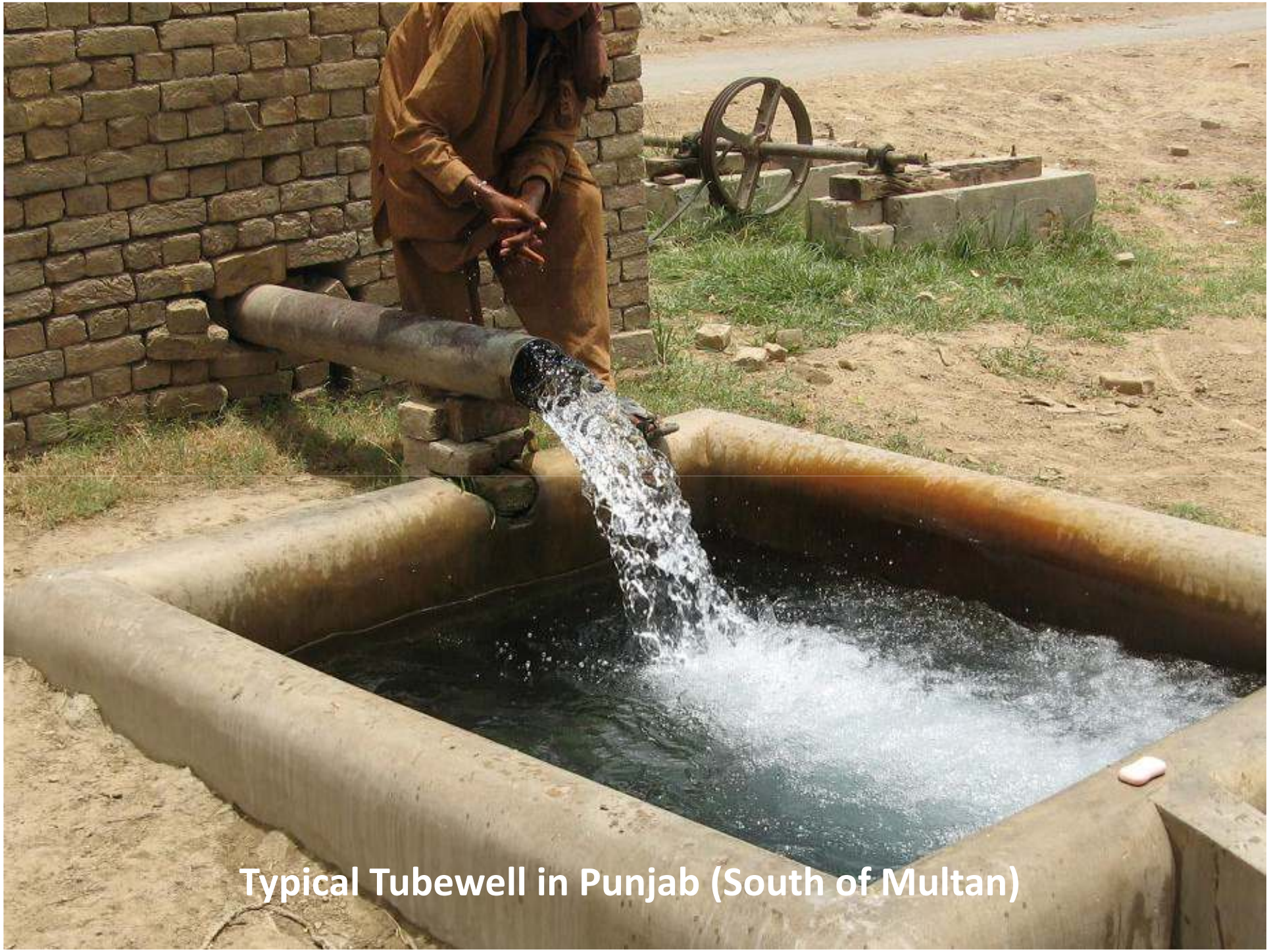
A Briefing Presentation
by
International Resources Group (IRG)

Typical field in Punjab prepared for irrigation
(the crop here is young cotton – 2nd sown cash crop)

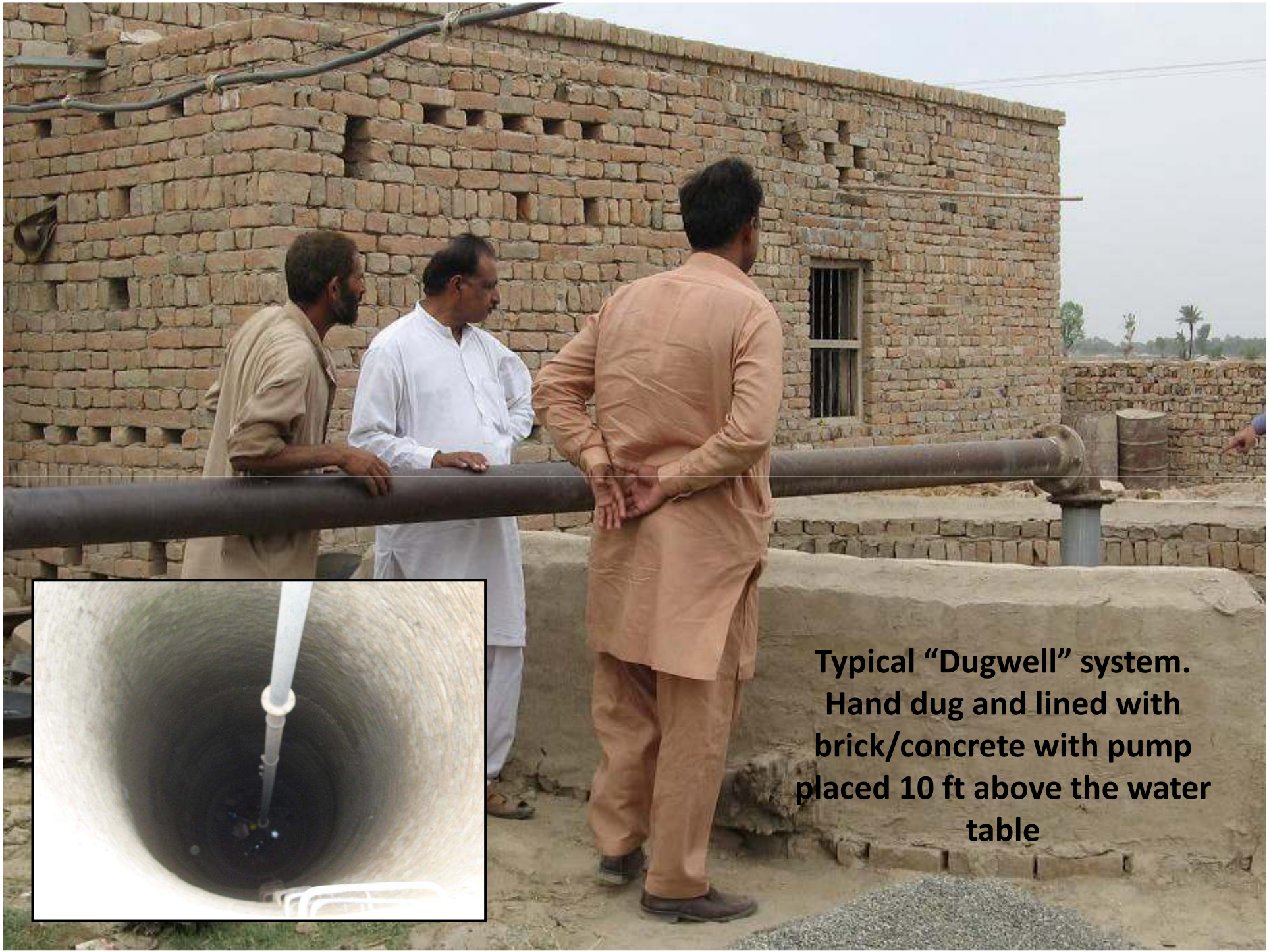


Typical irrigation canal in Punjab (South of Multan)

Typical “Dugwell” system. Hand dug and lined with brick/concrete with pump placed 10 ft above the water table

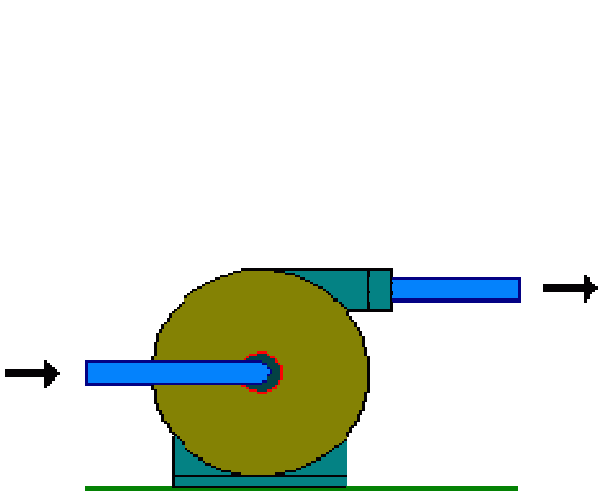


Typical Tubewell in Punjab (South of Multan)



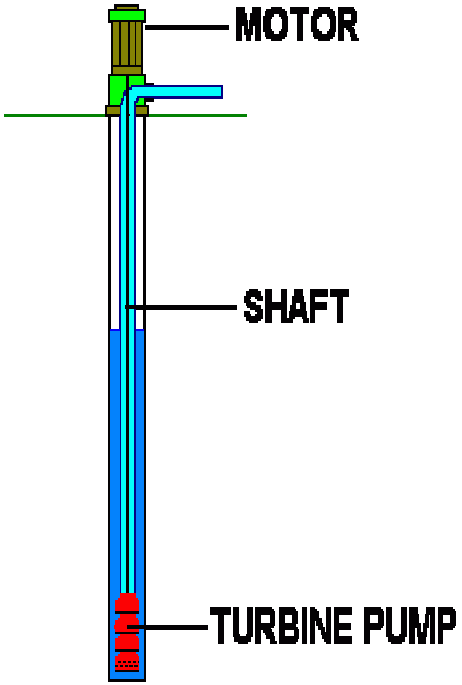
Typical “Dugwell” system. Hand dug and lined with brick/concrete with pump placed 10 ft above the water table

Centrifugal, Turbine, Submersible Pumps

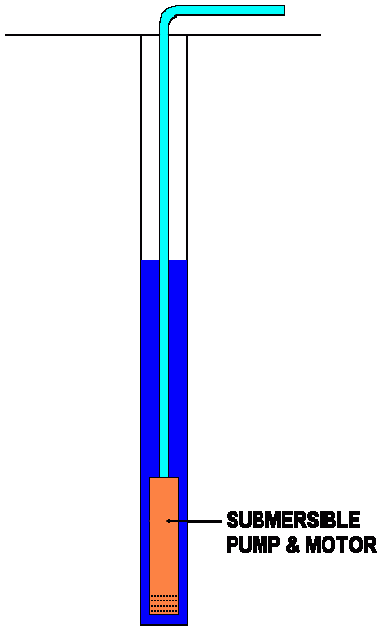


END-SUCTION CENTRIFUGAL PUMP

Head: 30 ft – 110 ft
Power: 5 - 30 hp



Head: 75 ft – 160 ft
Power: 20 – 30 hp



Head: > 150 ft

CENTRIFUGAL PUMPS

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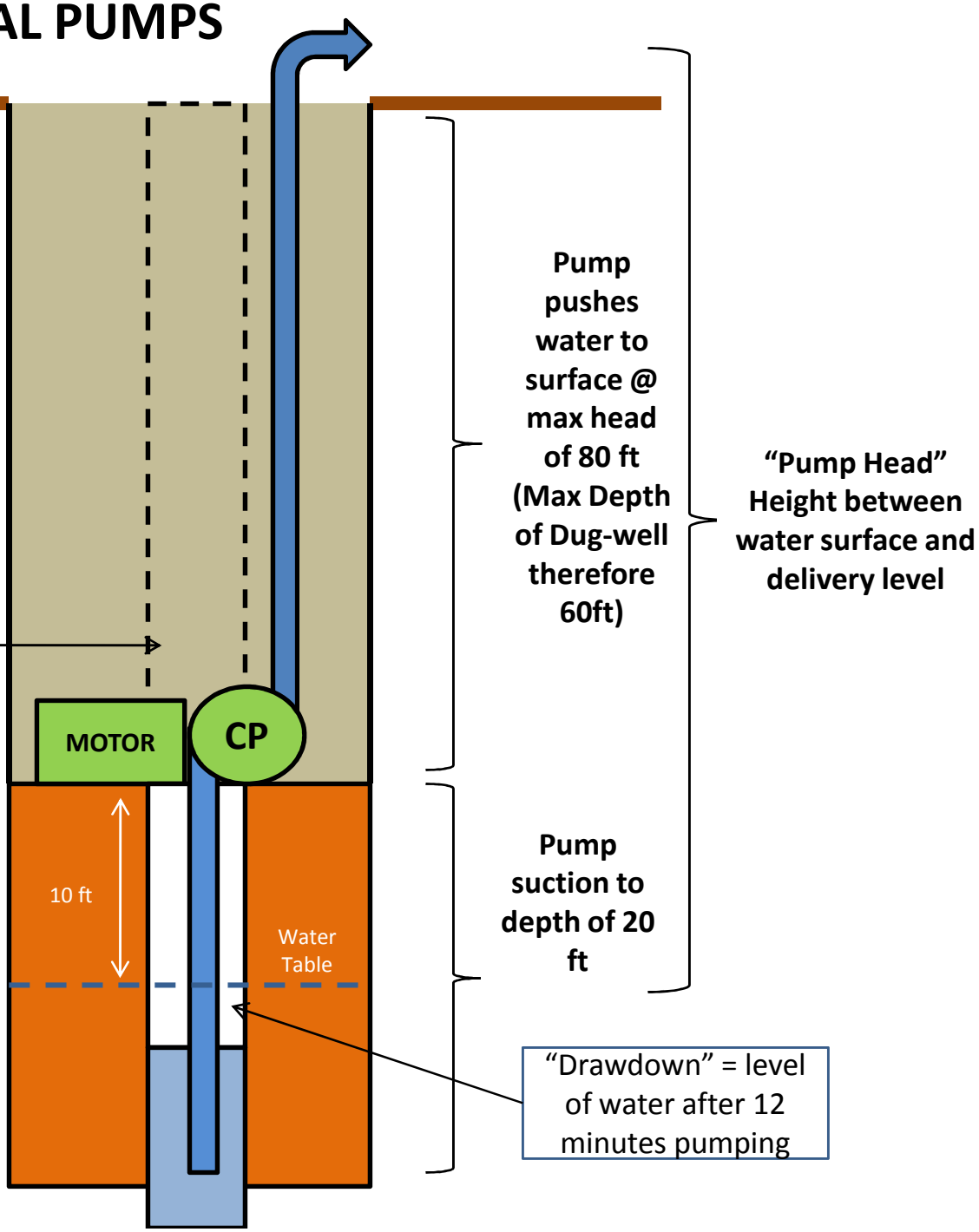
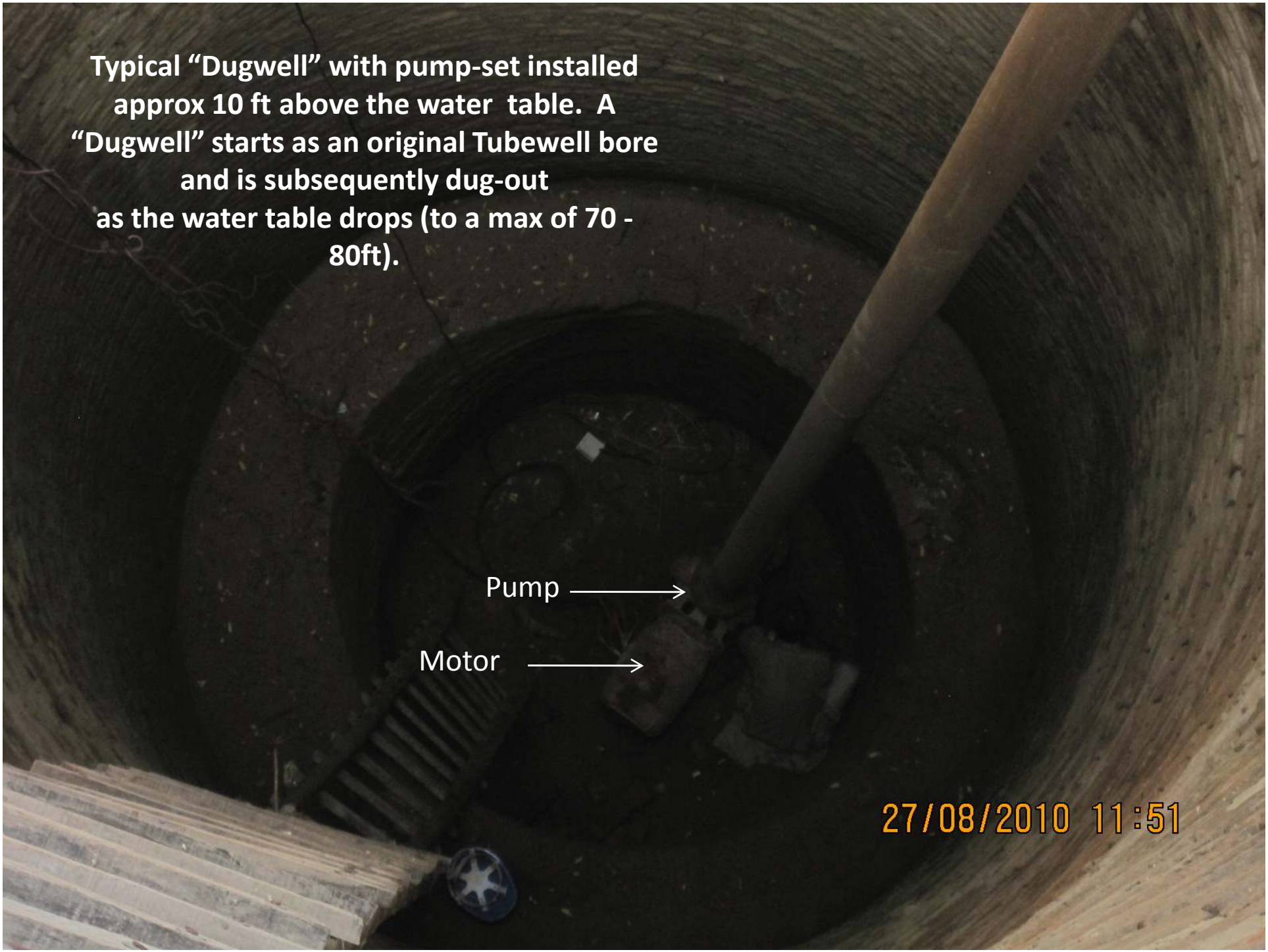
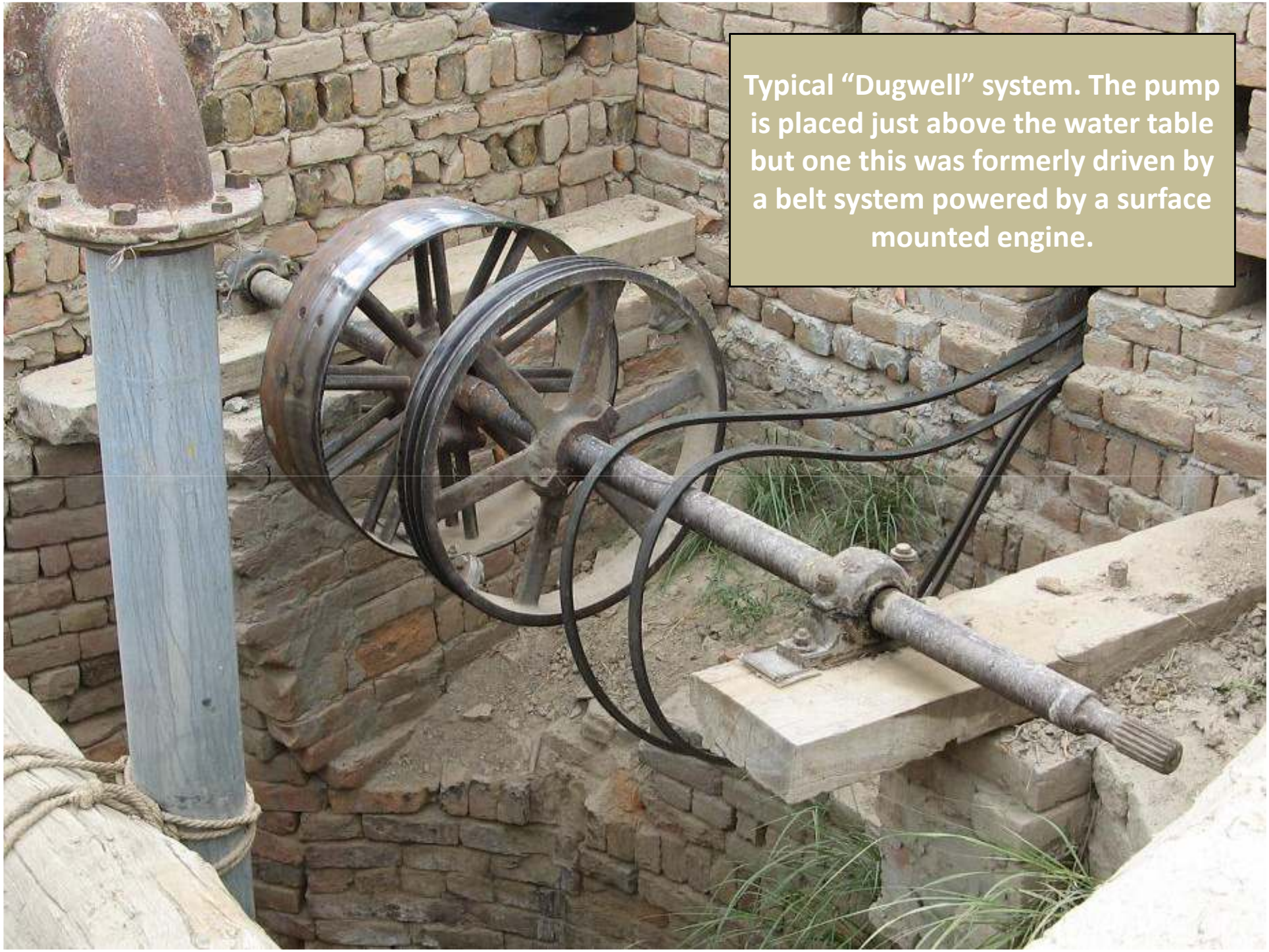
DUG-WELL CENTRIFUGAL PUMPS

ORIGINAL TUBEWELL
"Dug Down"




Descending into typical “dugwell”


Typical “Dugwell” with pump-set installed approx 10 ft above the water table. A “Dugwell” starts as an original Tubewell bore and is subsequently dug-out as the water table drops (to a max of 70 - 80ft).
Pump
Motor
27/08/2010 11:51



Typical “Dugwell” system. The pump is placed just above the water table but one this was formerly driven by a belt system powered by a surface mounted engine.

A new “Dugwell” Centrifugal Pump (with motor) to be placed just above the water table on a platform. This “pushes” a water column to the surface

TURBINE PUMPS

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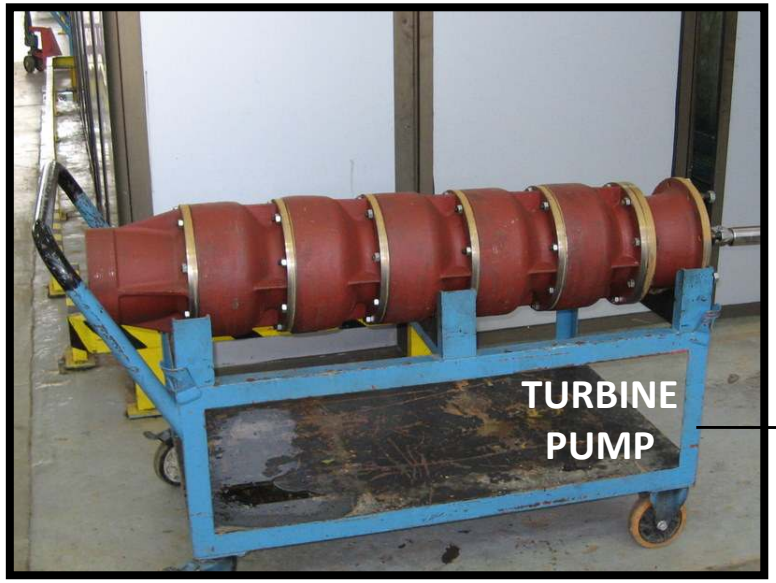
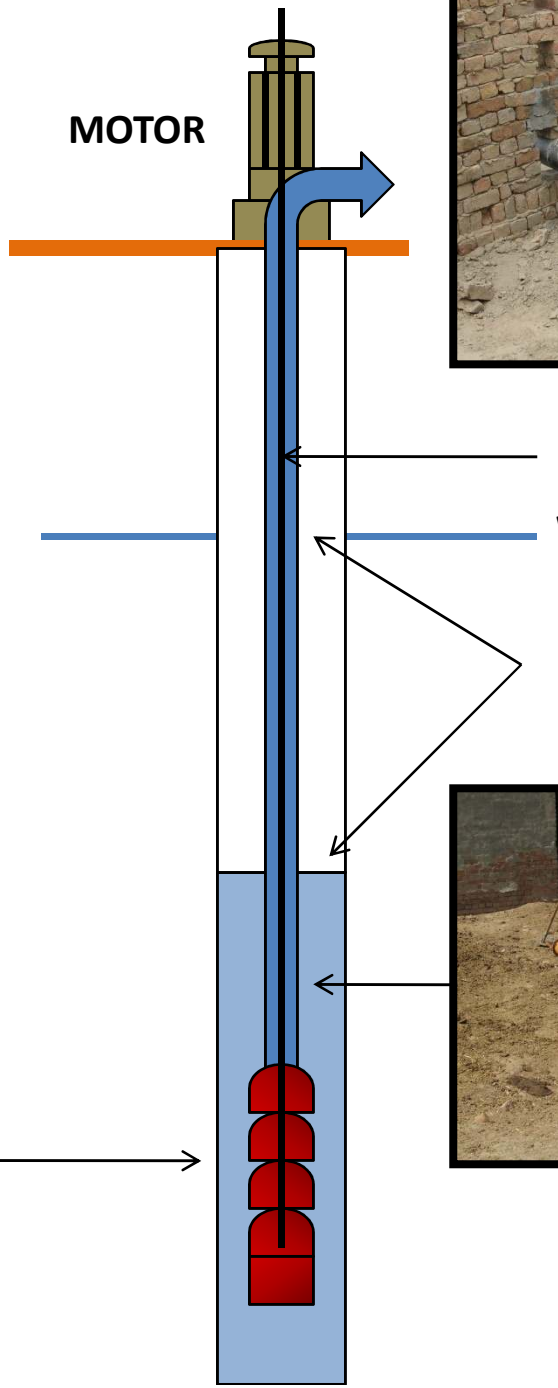
Typical Tubewell Turbine Pump in Punjab (South of Multan)

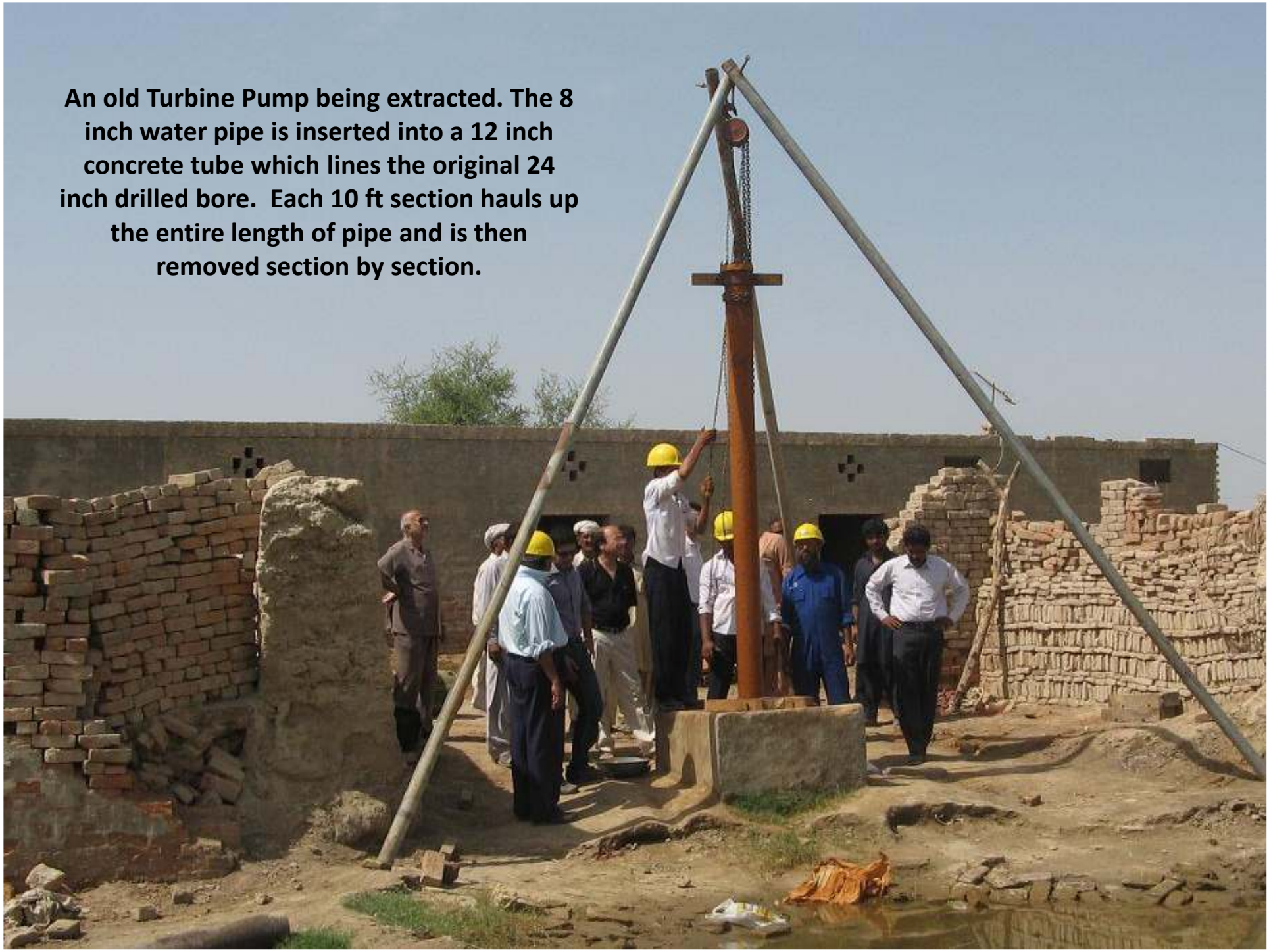
DEEPWELL TURBINE (DWT)

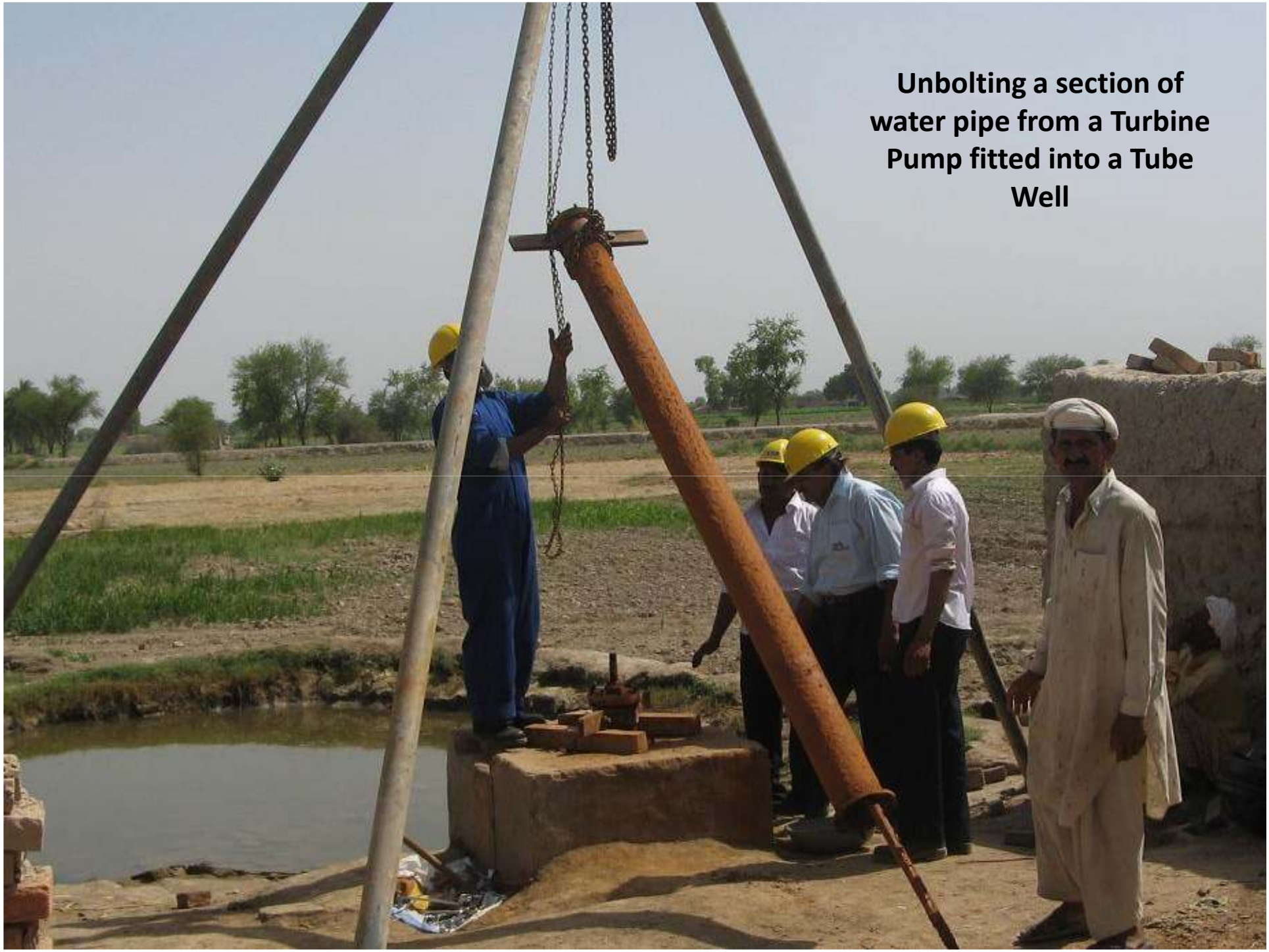




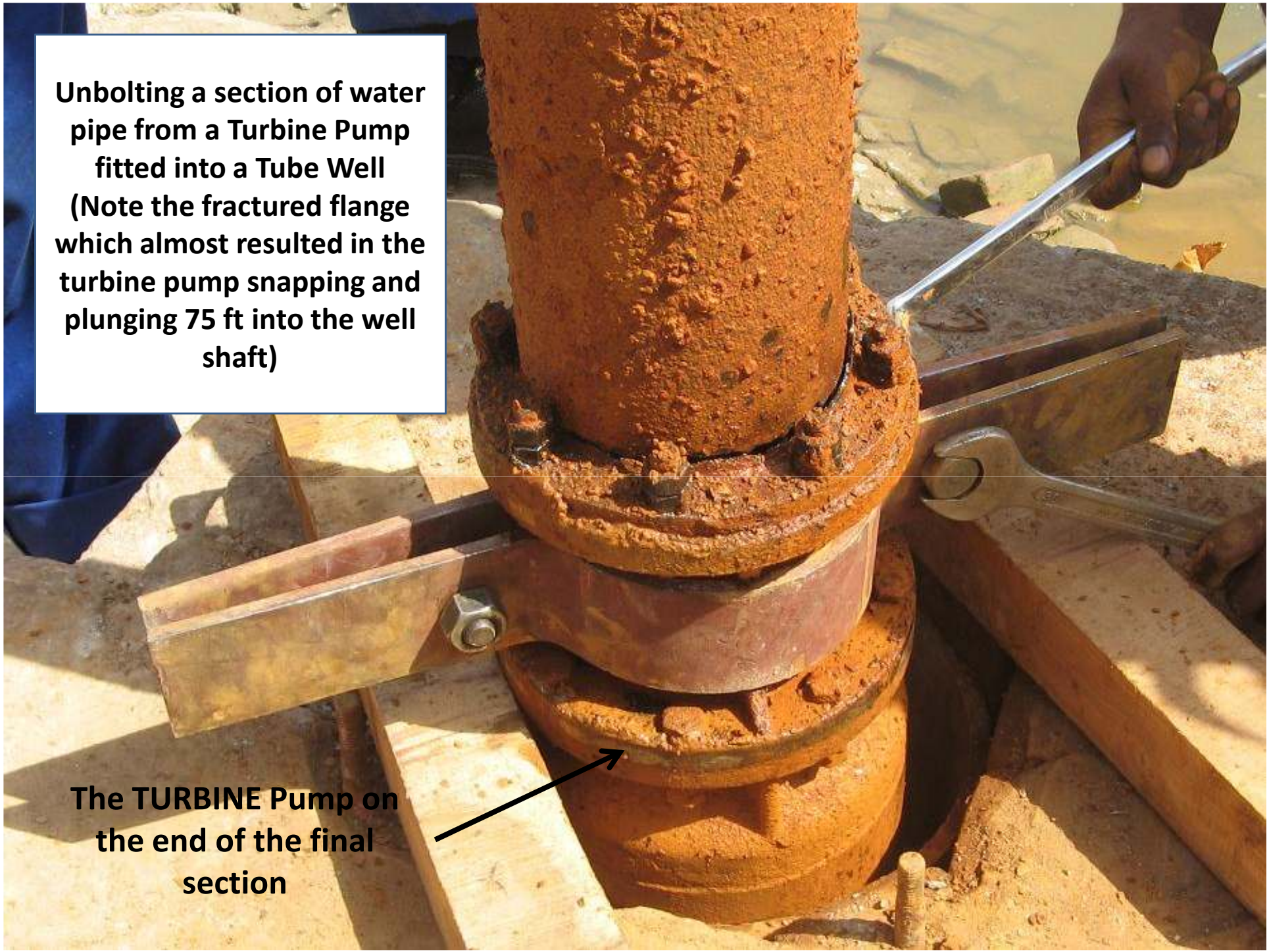
Newly fitted Siemens Turbine Pump fitted above new “civil works”

One of the first fitted Turbine Pumps of the Program


An old Turbine Pump being extracted. The 8 inch water pipe is inserted into a 12 inch concrete tube which lines the original 24 inch drilled bore. Each 10 ft section hauls up the entire length of pipe and is then removed section by section.



Unbolting a section of water pipe from a Turbine Pump fitted into a Tube Well


Unbolting a section of water pipe from a Turbine Pump fitted into a Tube Well (Note the fractured flange which almost resulted in the turbine pump snapping and plunging 75 ft into the well shaft)
The TURBINE Pump on the end of the final section

Sections of water pipe from a Turbine Pump extracted from a Tube Well

SUBMERSIBLE PUMPS

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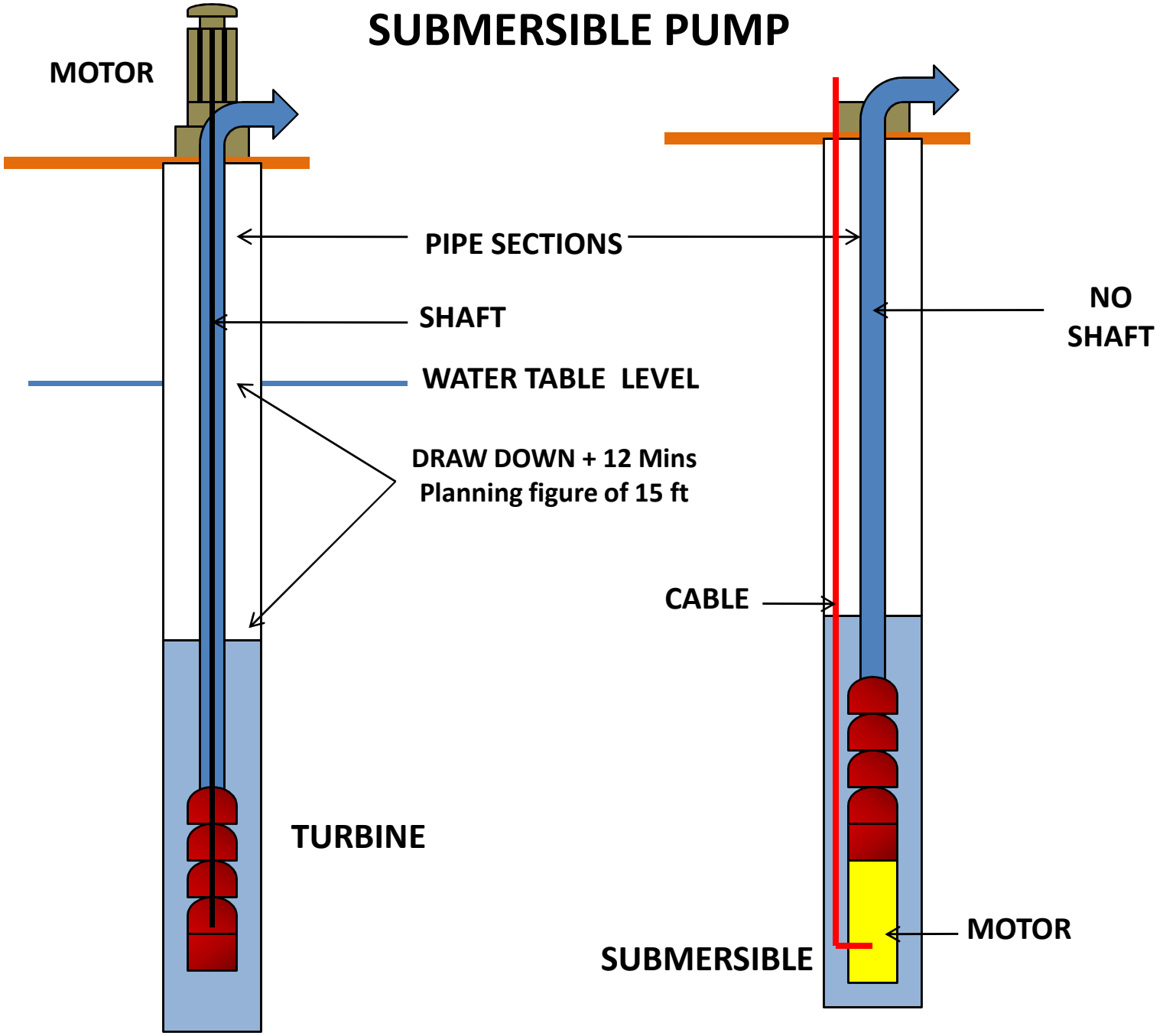
SUBMERSIBLE PUMP




HMA PUMPS

SO WHAT?

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Typical poor condition of old pump.
Note the external drive via external engine and rubber belts

NUMBER OF ELECTRIC TUBEWELLS BY DISCO REGION

DISCO	PROVINCE	Nos of TUBEWELLS
MEPCO	PUNJAB	60,000
LESCO	PUNJAB	35,000
GEPCO	PUNJAB	35,000
FESCO	PUNJAB	30,000
HESCO	SINDH	25,000
IESCO	PUNJAB	Negligible
PESCO	NWFP	25,000
TOTAL	Note: There are another 500,000 Diesel Driven Pumps	230,000

PHASE 1 PILOT:

THE PUNJAB
South of MULTAN

“Setting the Scene”

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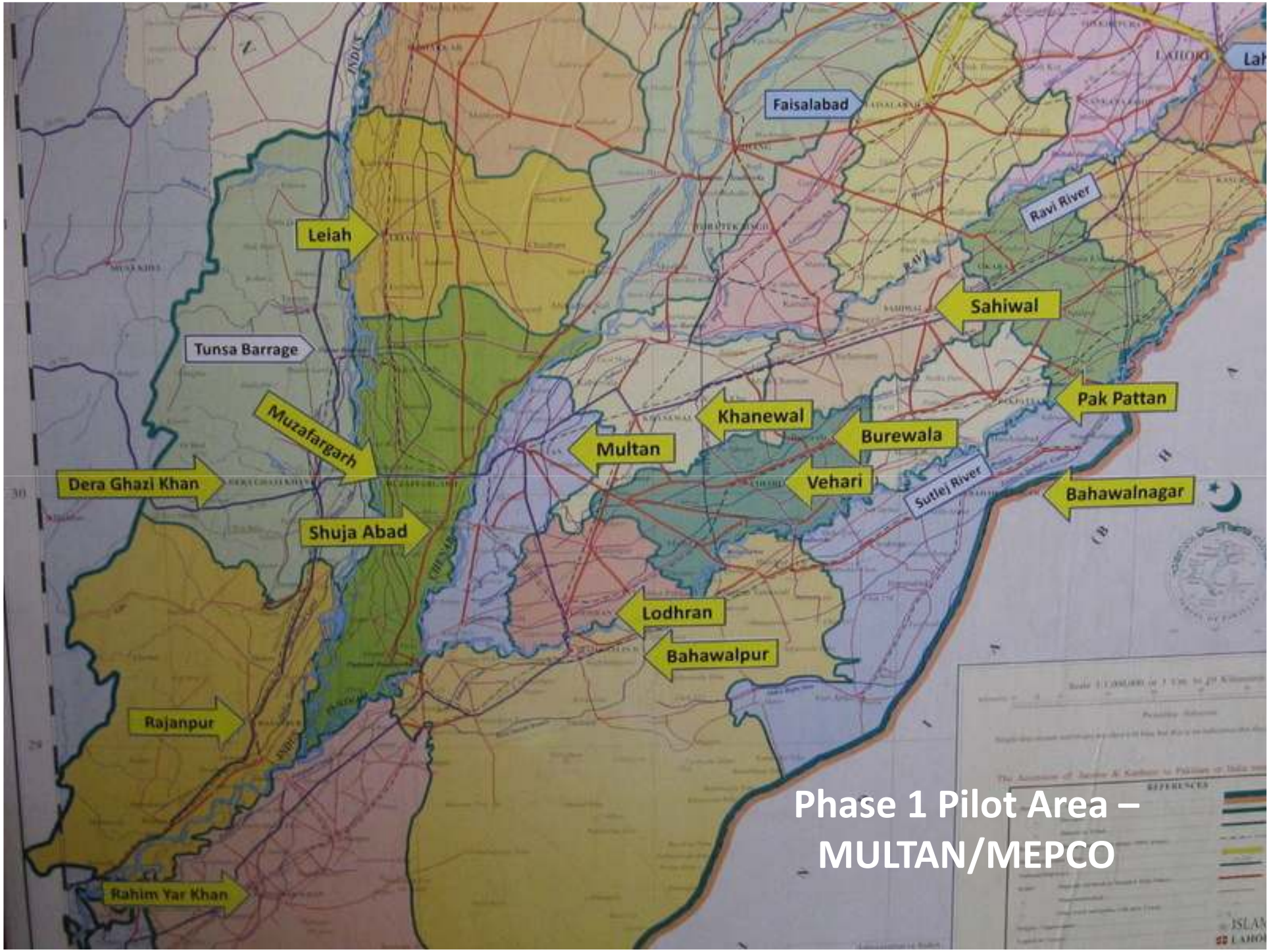
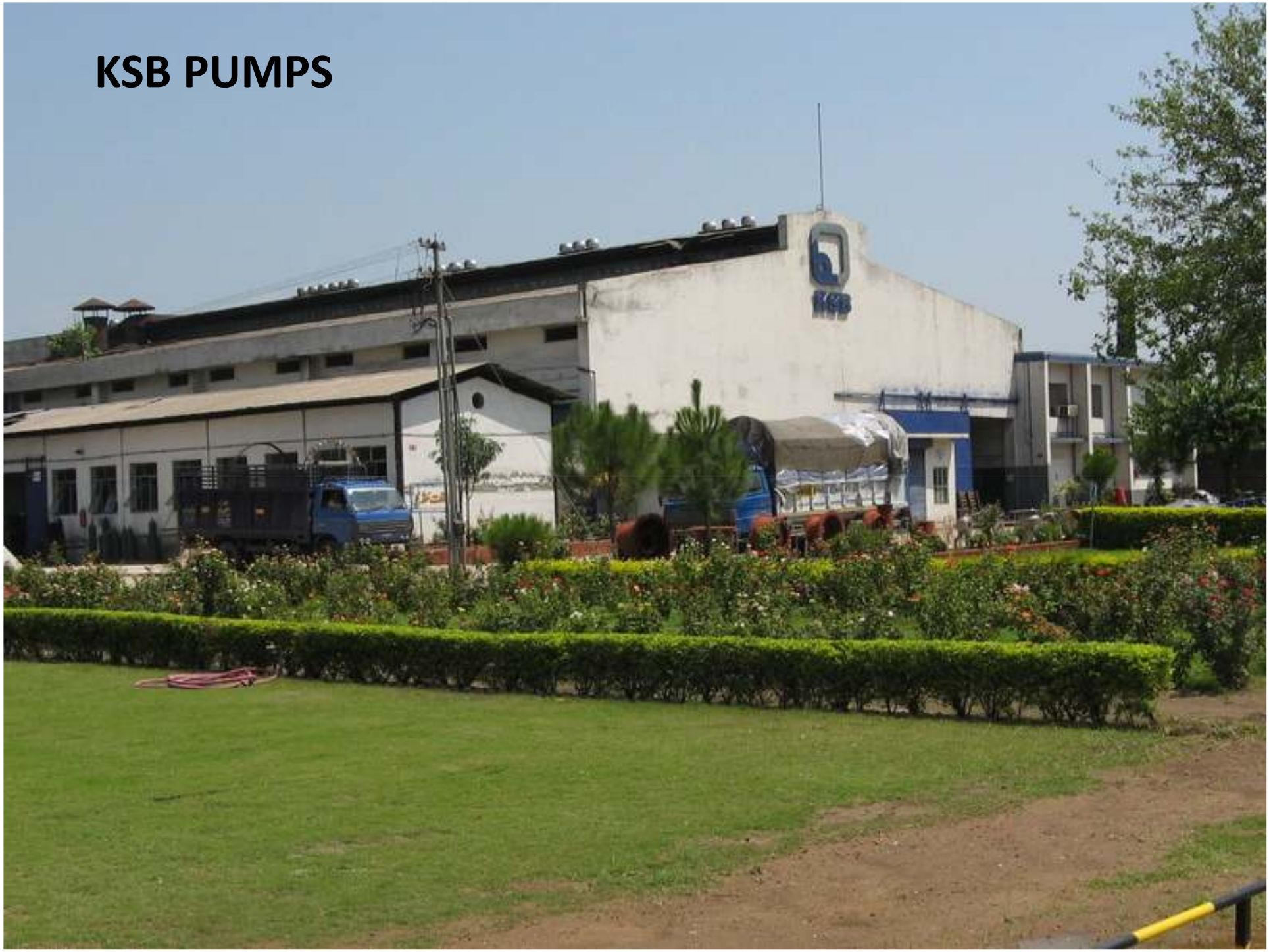

Faisalabad
Ravi River
Leiah
Sahiwal
Tunsa Barrage
Pak Pattan
Khanewal
Muzafargarh
Burewala
Multan
Dera Ghazi Khan
Vehari
Sutlej River
Bahawalnagar
Shuja Abad
Lodhran
Bahawalpur
Rajanpur
Rahim Yar Khan
Phase 1 Pilot Area –
MULTAN/MEPCO

KSB PUMPS




KSB PUMPS


FARMER MEETINGS


02/04/2010 11:53

A newly installed Turbine Pump system. This farmer has four pumps and has recently diversified into growing vegetables and fruit under plastic covered hoops (a new concept for this area)

The Goal of TWEIP is to demonstrate the potential to significantly improve the efficiency of the use of electricity in the world's largest irrigation-based agricultural system.

The Purpose of TWEIP's is to:

a.Reduce peak demand for electricity approximately 45 MW.
b.Save approximately 115.5 GWh of electricity per year.
c.Reduce electricity bills of participating farmers to a total of approximately $7.7 million per year.
d.Accrue about $3.7 million per year in savings to the seven participating DISCOs from the reduction in sales of subsidized electricity to the farmer.
e.Provide benefits of more-reliable agricultural pump sets to participating farmers.
f. Demonstrate the multiple benefits of a replicable energy efficiency improvement program.

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PHASE 2 TWEIP PROGRAM TARGETS

- 20 Month Program
- Target – 9000 Pumps
- 45MW saved at peak times
- 115 GWh saved per year

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KSB PUMPS

SAER®

SAER ELETTROPOMPE (Italy)

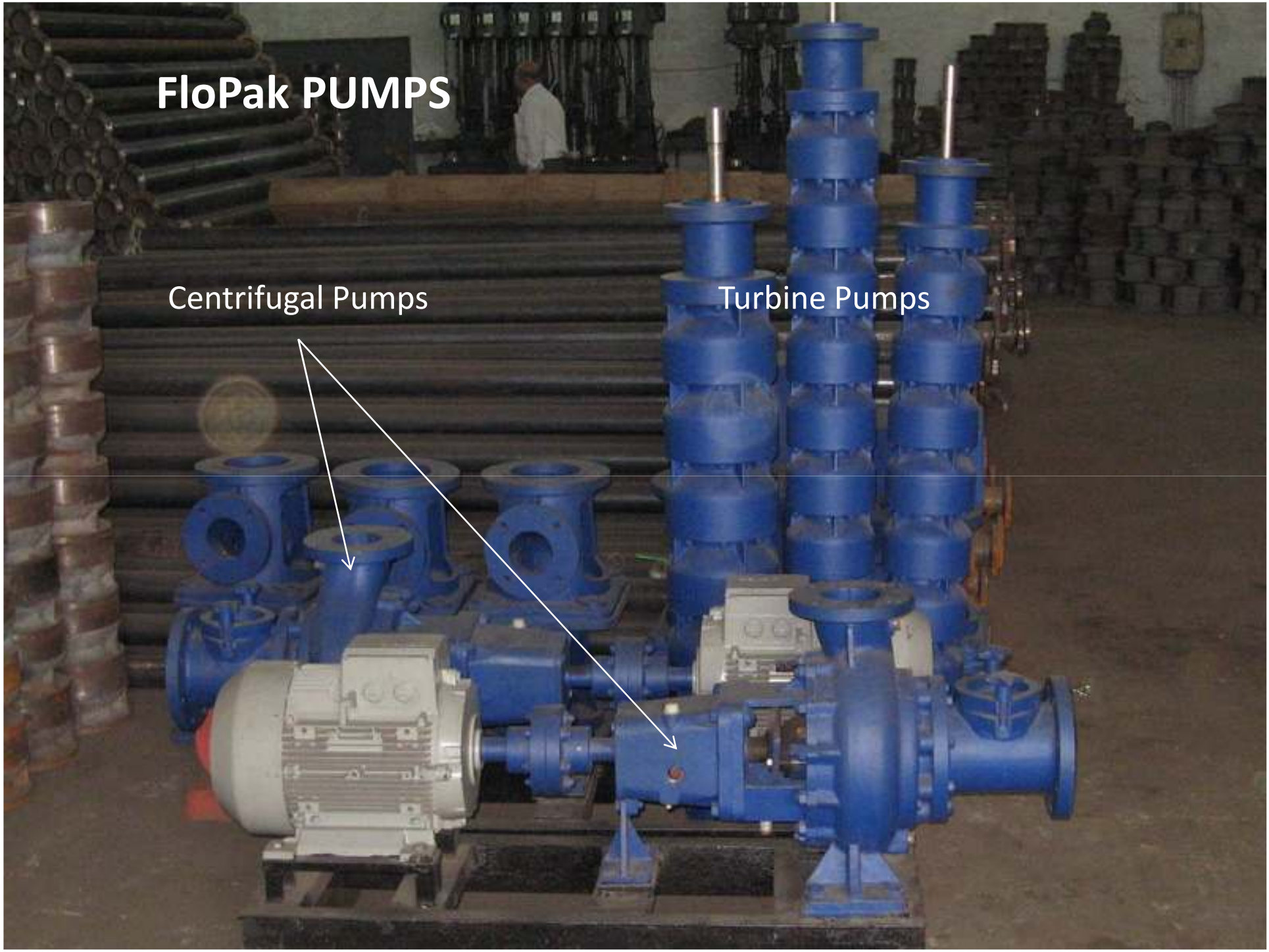
GOLDEN PUMPS

OFFICIAL PARTNERS IN PAKISTAN

TÜV SÜD ISO 9001


PECO PUMPS


MECO PUMPS


FloPak PUMPS
Centrifugal Pumps
Turbine Pumps


HMA PUMPS

CERTIFICATION & TESTING (Q&A)

A Program appointed company will be responsible for visiting all Pump Suppliers applying to participate in the program to “certify” that their pumps and motors meet the standards of efficiency required for the program.

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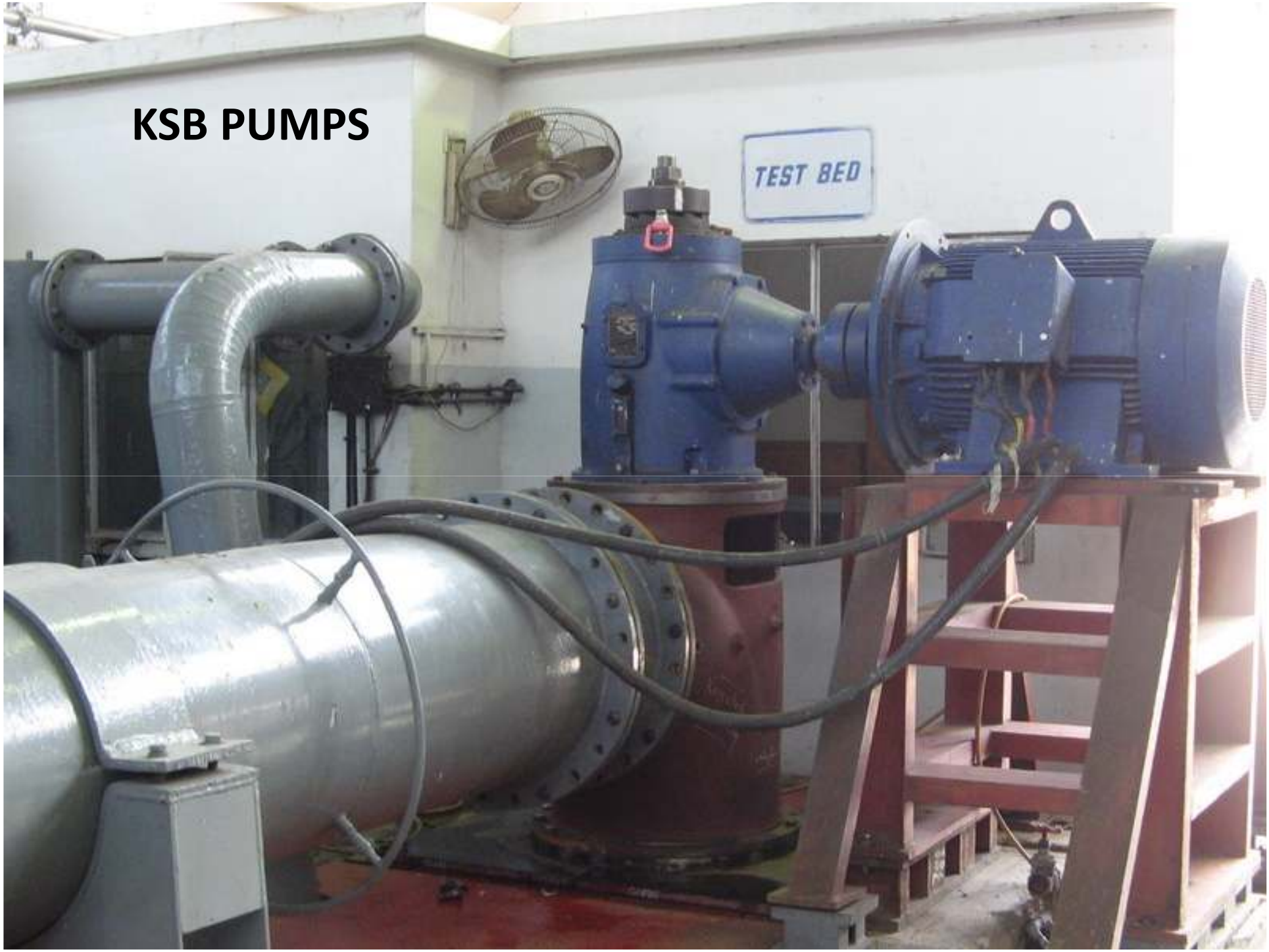
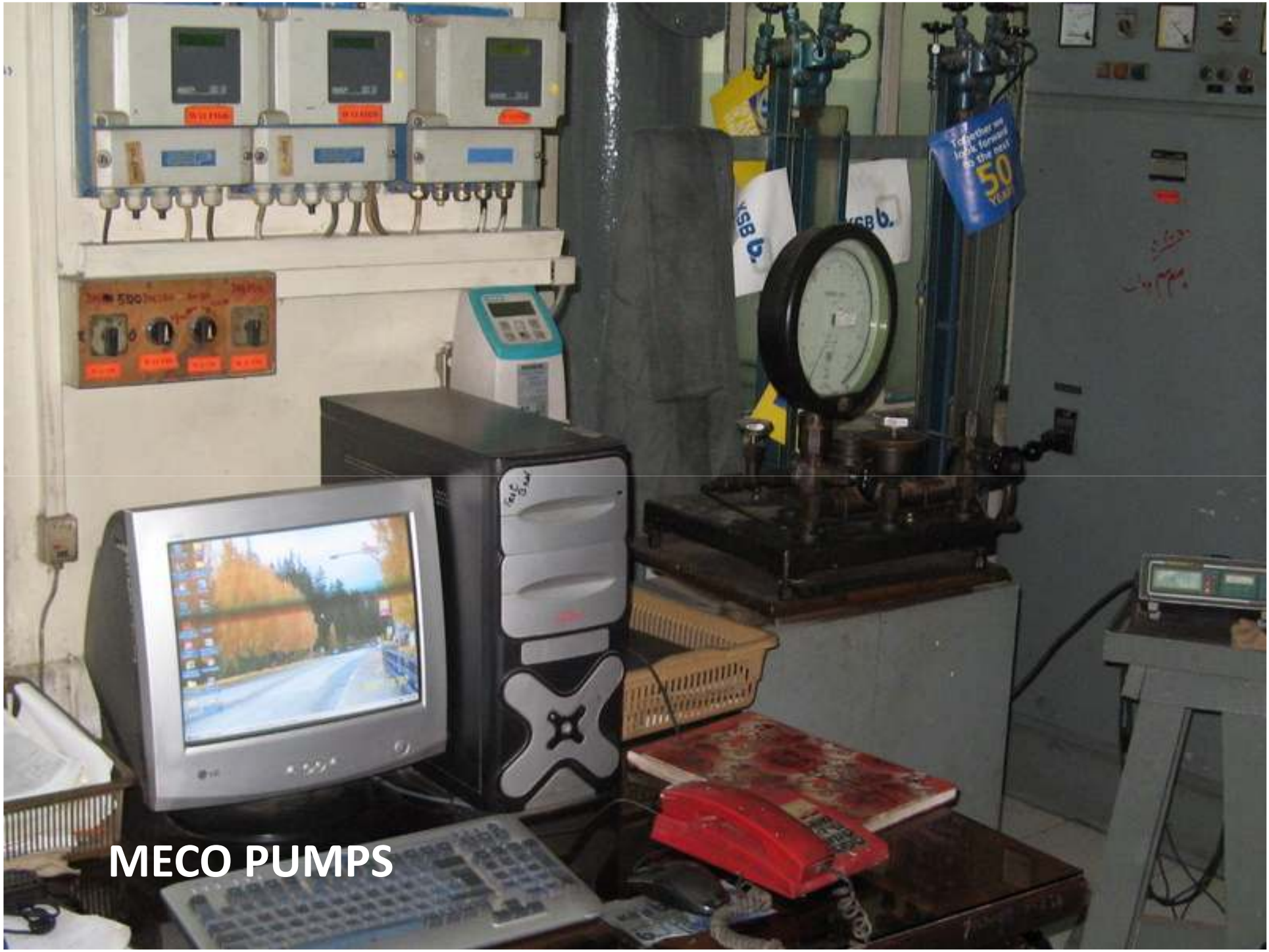
KSB PUMPS



MECO PUMPS TEST FACILITIES


MECO PUMPS


FloPak PUMPS


FloPak PUMPS

MOTOR PRODUCTION

for TUBEWELL PUMPS

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SIEMENS FACTORY – KARACHI – WINDING 30HP TURBINE “STATORS”

SIEMENS FACTORY – KARACHI – WINDING 30HP TURBINE “ARMATUREs”

PARTS for 30HP TURBINE MOTORS

SO WHAT IS THE PROJECT DOING?

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PHASE 2 OPERATIONS

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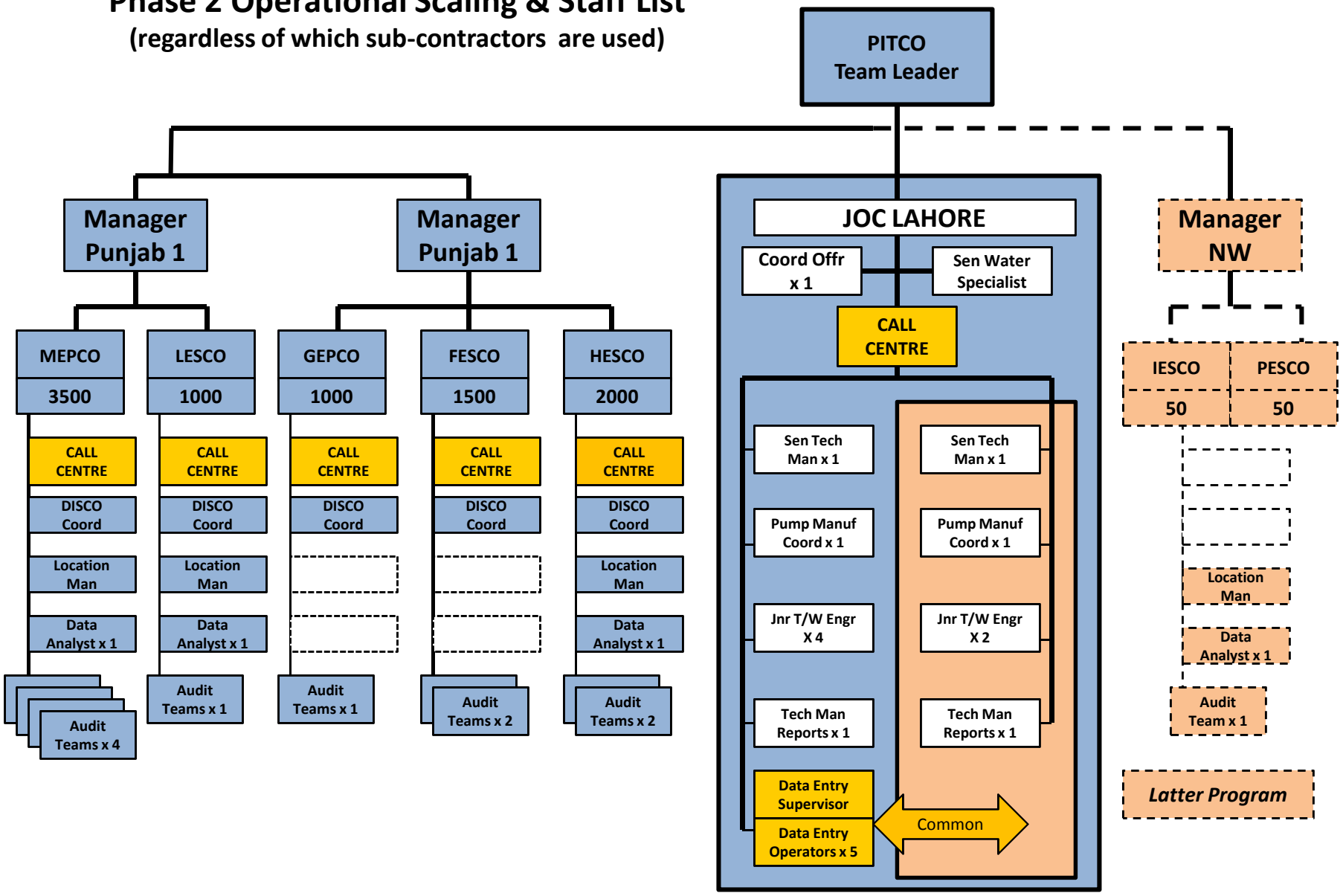
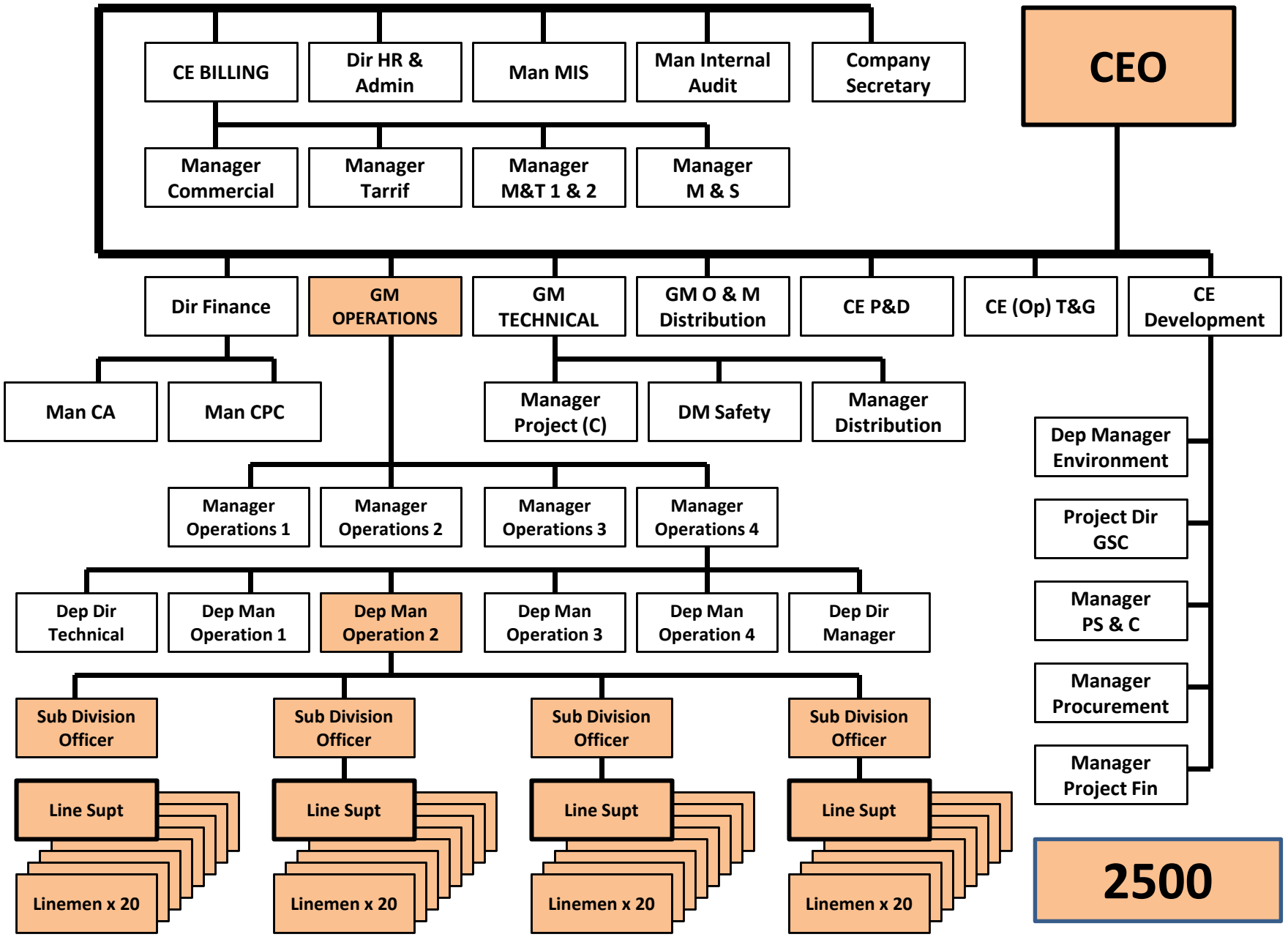
Phase 2 Operational Scaling & Staff List

(regardless of which sub-contractors are used)



ORGANISATION OF MEPCO



TWEIP MARKETING & AWARENESS

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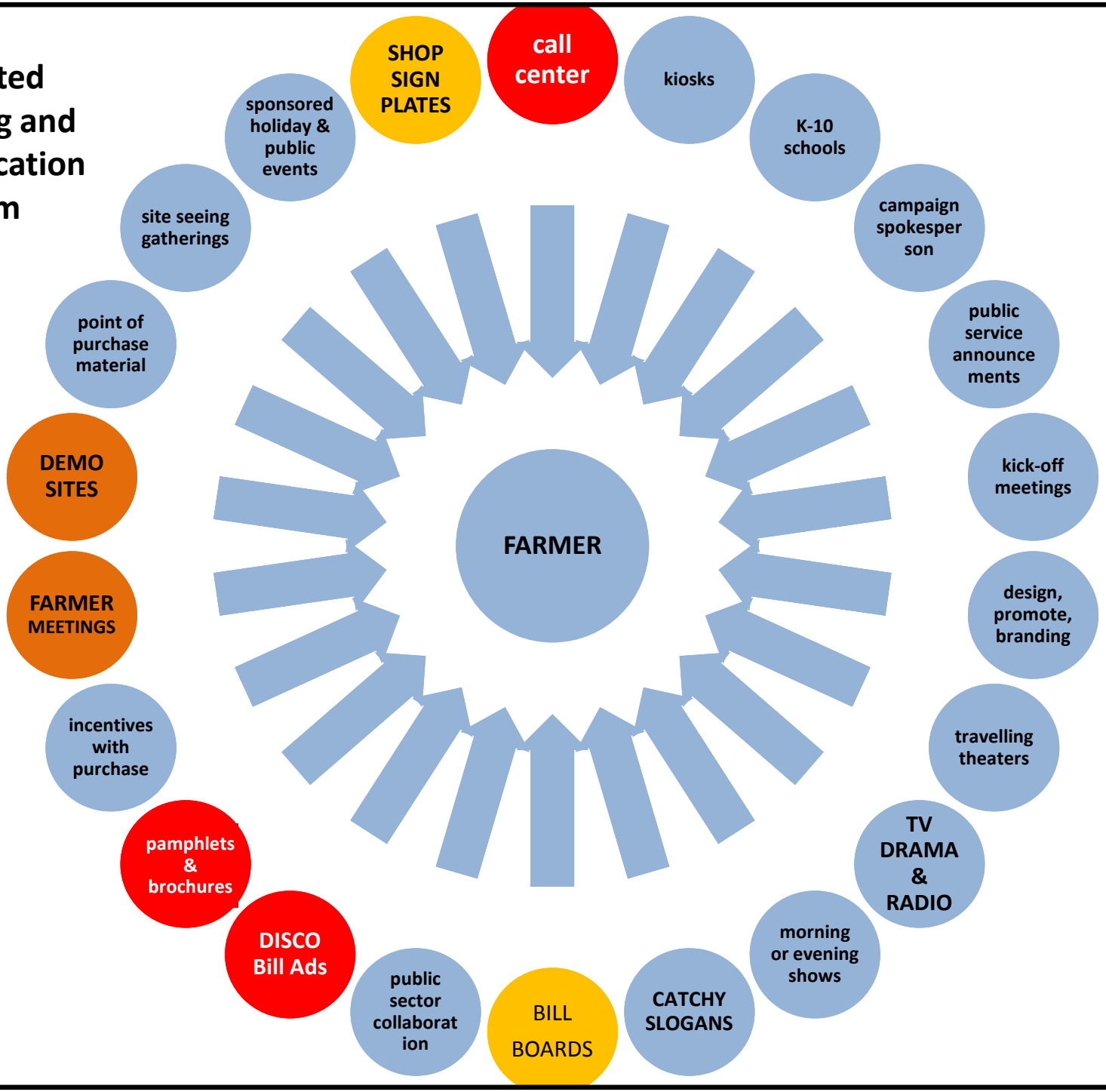
Integrated Marketing and Communication System



How to Participate

If you wish to participate in the program you can request further information from the Program Call Centre at: XXXXXXXXXXX

It is fundamental requirement of the program to produce the SAME LEVEL of water, with less energy. Consequently, the pump and motor may be of smaller size than the existing pump set, BUT will deliver the same quantity of water.

1. You may approach any , and all, of the Pump Suppliers Certified to participate in the program to seek further advice.
2. Your "interest" will be secured by a signing a Letter of Intent, and a 1500 Rupee deposit, to activate a follow up visit by Program representatives to audit your existing pump to identify current efficiency and power usage. The 1500 R deposit is credited against the pump cost.
3. You will receive Quotation for the costs of pump and installation (from the suppliers of your choice), for which you will pay ONLY 50% of the pump set cost. Installation is free.
4. Your replacement pump will be installed within 60 days of your initial payment.

IRG
an IG company

TUBEWELL EFFICIENCY IMPLEMENTATION PROGRAM

Save Energy

Reduce Your Bills

A sponsored program to replace inefficient tubewell pumps and motors with new efficient pump sets with a 50% subsidy provided by:

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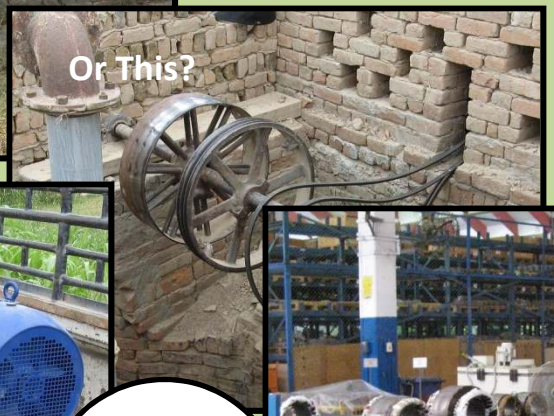
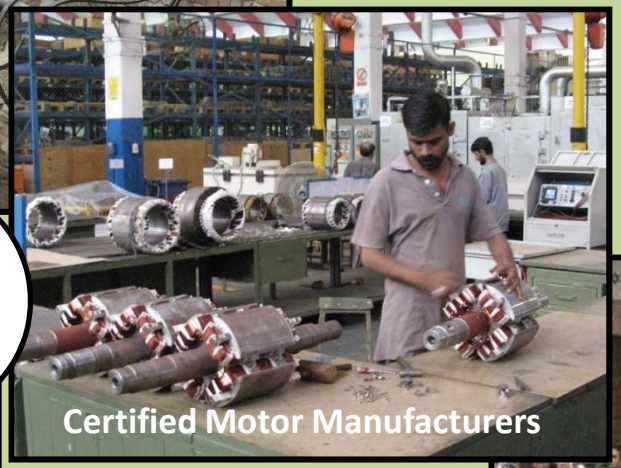
TUBEWELL EFFICIENCY IMPLEMENTATION PROGRAM



50%
Subsidy



PARTICIPATING
(CERTIFIED) PUMP SUPPLIERS

KSB Pumps:	Contact: xxxxxxxx
HMA Pumps:	Contact: xxxxxxxx
PECO Pumps:	Contact: xxxxxxxx
MEC Pumps:	Contact: xxxxxxxx
Pumps:	Contact: xxxxxxxx
FloPak Pumps:	Contact: xxxxxxxx

TBC

MARKETING
Demonstration Sites

“The First Program Pump Installed”

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ADVERTISING IN ELECTRICITY BILLS

FAISALABAD ELECTRIC SUPPLY COMPANY - ELECTRICITY CONSUMER BILL (MDI)

www.fesco.com.pk

SUB-DIVISION	FAS@	ED%	BILL MONTH	READING DATE	ISSUE DATE	DUE DATE
NARWALA ROAD		1.0%	Jul 10	09 JUL 10	14 JUL 10	28 JUL 10

REFERENCE No.	TARIFF	SANC. LOAD	OLD A/C No.
24 13225 5403560 U	B2b (12)T	149.00	24322554035603

Incase of non attendance or non satisfaction from given complaint numbers, please contact the Electric Inspector at New Civil Line, Opposite Commissioner Office, Goraya Road, Faisalabad. Tel: 041-9210221,9200551 Fax: 041-9201143

NAME & ADDRESS
PERVEEN AKHTAR
WO MUHAMMAD YASIN
CK NO 67 JB SADAHAR
FSD
FIRST BILL FROM DATE OF CONNECTION: 28-DEC-97
MNFG CD : 33

FESCO GST # 24-00-2716-001-19
GST No.24-00-8446-043 73 & NTN No.00-00-2590052
For Comp. SDO: 0333-9944694 XEN: 0000-0000000
Theft Reporting Call Toll Free # 0800-Theft(84338)

Income Tax Paid For 2009-10 259113

DIVISION G.MUHAMMAD ABAD
FEEDER NEW SABZI MANDI

Prv C.MDI	Prs. C.MDI	Res NO.	Monthly Adv. Bill	P.F
4.280	9.650	8	502775	0.82

KWH METER READING				KVARH METER READING				MDI METER READING			METER STATUS
METER No.	PREVIOUS	PRESENT	MF	PREVIOUS	PRESENT	MF		PRESENT	MF		
1226	1218	1676	80	792	1106	80		1.430	80		
1226	180	271	80	120	184	80		1.400	80		

UNITS CONSUMED				LOAD CHARGED	
(O) 36640	(P) 7280	(O) 25120	(P) 5120	95	(P) 19

ENERGY / FIXED CHARGES	LPF PENALTY A. SURCHARGE	FAS SEASON CHARGES	ED INSTALMENTS	METER/ SERVICE RENT
310817.27	5866.36	4,392.00	3108.17	
36664.76				
SURCHARGE 6494		INCOME TAX	UNPAID DEBT	DEFERRED AMOUNT
	58017	30461		

CURRENT BILL	500427
ARREARS/AGE	
TARIFF SUBSIDY + GST	
PAYABLE WITHIN DUE DATE	500427
L.P. SURCHARGE	35774
GST ON LPS	
PAYABLE AFTER DUE DATE For Detail FPA Calculation Visit www.pepco.gov.pk	536201

TO AVAIL 7% INCENTIVE, YOU MAY DEPOSIT ADVANCE AMOUNT @ RS. 502775 PER MONTH FOR THE MONTHS YOU WISH

BILL ADJ.

PTV FEE

Fuel Price Adjustment for FPA = 51,100.46

Electricity THEFT reporting Call Toll Free # 0800 84338 (THEFT)

MONTH	TOU MDI	TOU KWH UNITS	BILL	PAYMENT	MONTH	MDI	KWH UNITS	BILL	PAYMENT
JUL 09	96	39864	332134	332134	JAN 10	10	1552	217646	0
AUG	96	30644	263668	263668	FEB	52	17548	412962	0
SEP	96	44948	368957	368957	MAR	63	22404	664568	315056
OCT	56	22588	191806	191806	APR	159	34784	693490	480888
NOV	51	12800	130562	130562	MAY	100	44160	522786	57
DEC	54	9036	209570	0	JUN	118	49040	525105	71

BANK COPY — CUT HERE

FAISALABAD ELECTRIC SUPPLY COMPANY - ELECTRICITY CONSUMER BILL (MDI)

www.fesco.com.pk

Bill No. 5,025

Bank Stamp

Jul 10 - 24 13225 5403560 000500427 - 28 JUL 10 - 6

BILL MONTH	DUE DATE	REFERENCE No.	
Jul 10	28 JUL 10	24 13225 5403560 U	PAYABLE WITHIN DUE DATE 500427
			PAYABLE AFTER DUE DATE 536201

BANK COPY — CUT HERE

ہدایات برائے درستگی بل

۱۔ اگر بل میں بقایاجات غلط شامل ہیں تو ادا شدہ بل دکھا کر بینک یا زونل کمپلینٹ سنٹر / موبائل کمپلینٹ سنٹر سے درست کروائیں۔

۲۔ میٹر ریڈنگ غلط ہونے کی صورت میں سب ڈویژن جس کا نام بل پر درج ہے، سے درست کروائیں۔

۳۔ بل نہ ملنے کی صورت میں متعلقہ اسسٹنٹ منیجر (آپریشن) / زونل کمپلینٹ سنٹر / موبائل کمپلینٹ سنٹر یا اسسٹنٹ منیجر (کمرشل) سے رجوع کریں۔

۴۔ بجلی منقطع کرنے کے احکامات بقایاجات کی ادائیگی کی رسید دکھا کر واپس کروالیں۔

۵۔ بل بذاتے متعلق اگر کسی قسم کا اعتراض ہو تو بل پر درج آخری تاریخ ادائیگی تک متعلقہ اسسٹنٹ منیجر (آپریشن) / زونل کمپلینٹ سنٹر / موبائل کمپلینٹ سنٹر یا اسسٹنٹ منیجر (کمرشل) کو آگاہ کریں بصورت دیگر بل ہر لحاظ سے درست تصور کیا جائے گا۔

AUDITING OPERATIONS
Pre Installation Audits of Old Pumps

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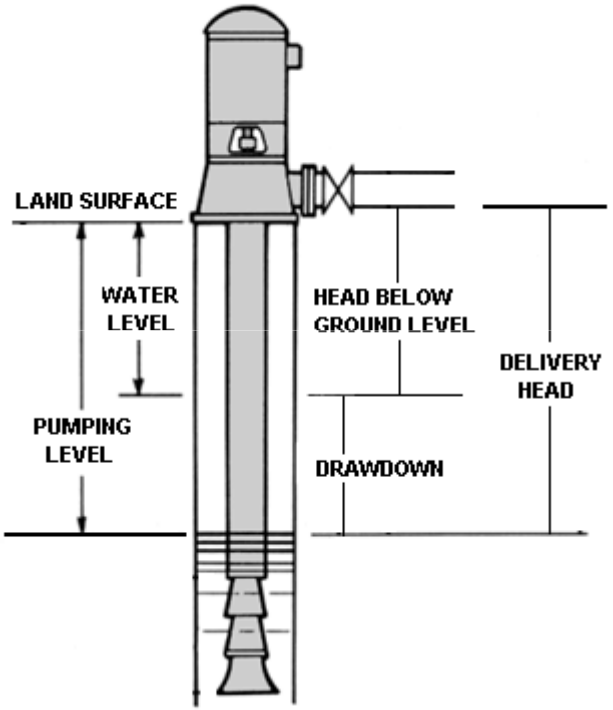
Pre-Installation Auditing of Old Pump Set
Drilling a hole in the Pump Base to insert Water Level Instrumentation

Pre-Installation Auditing of Old Pump Set
Inserting Water Level Instrumentation

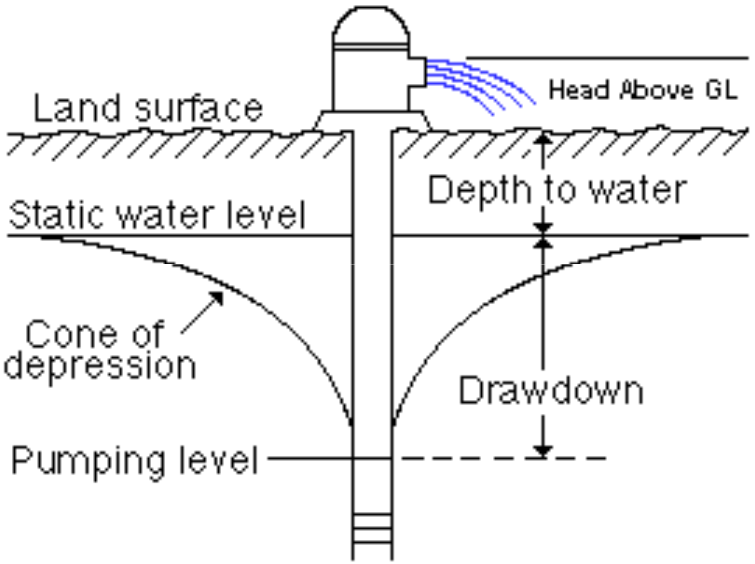
26/08/2010 18:24

Pre-Installation Auditing of Old Pump Set

Head Calculation

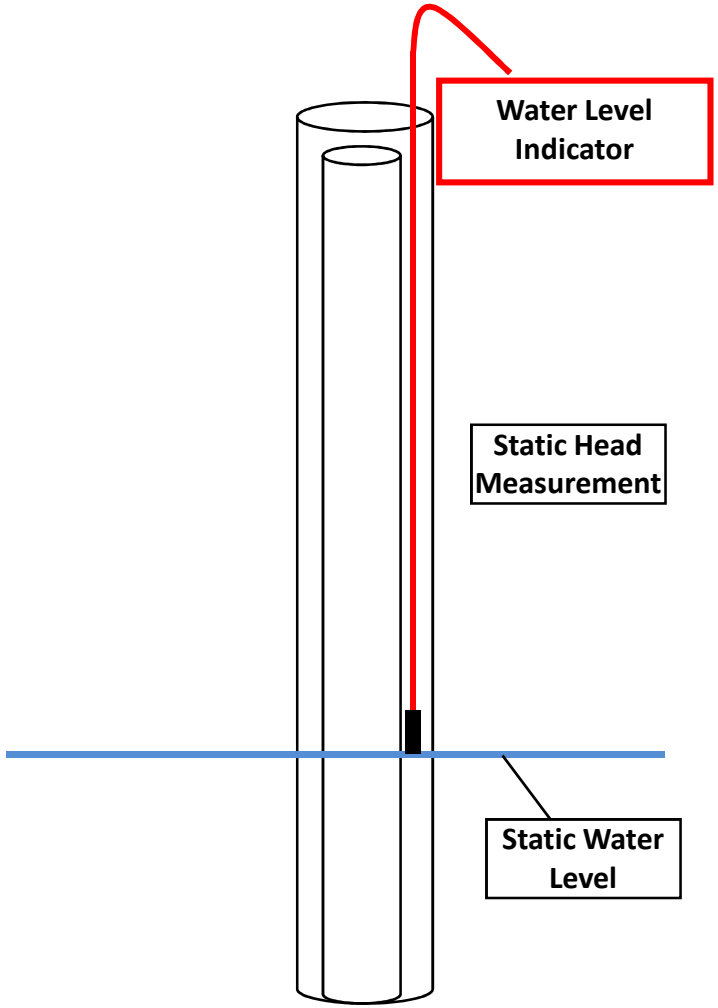


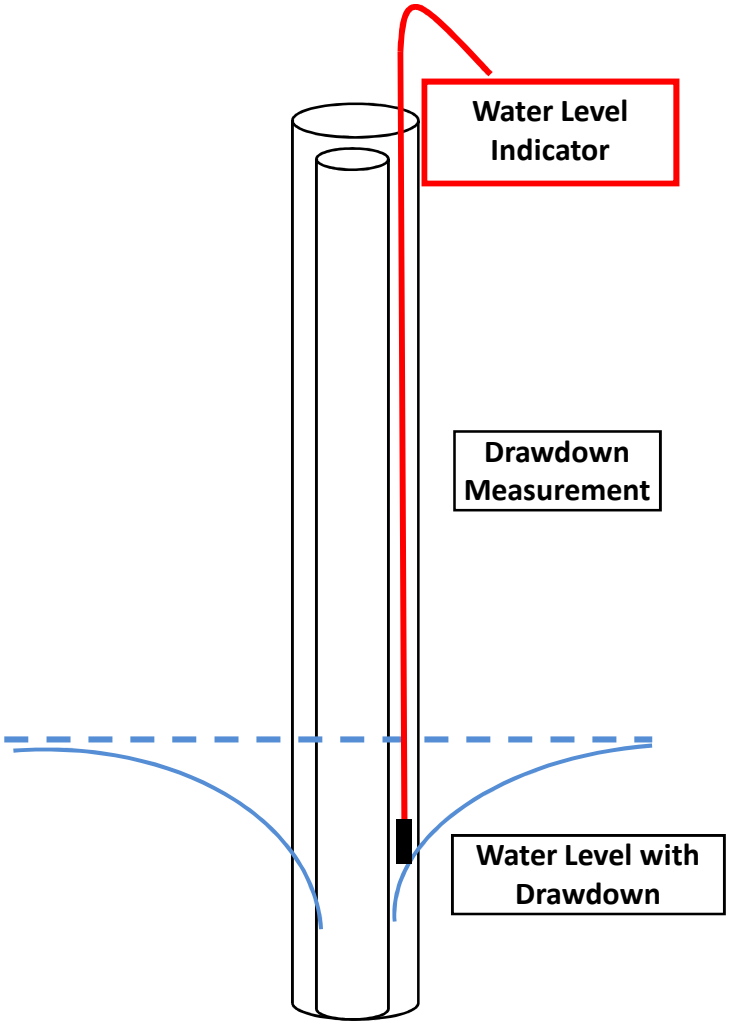
Turbine



Centrifugal

Water Level Measurement





SO HOW IS THE PROJECT LOOKING?

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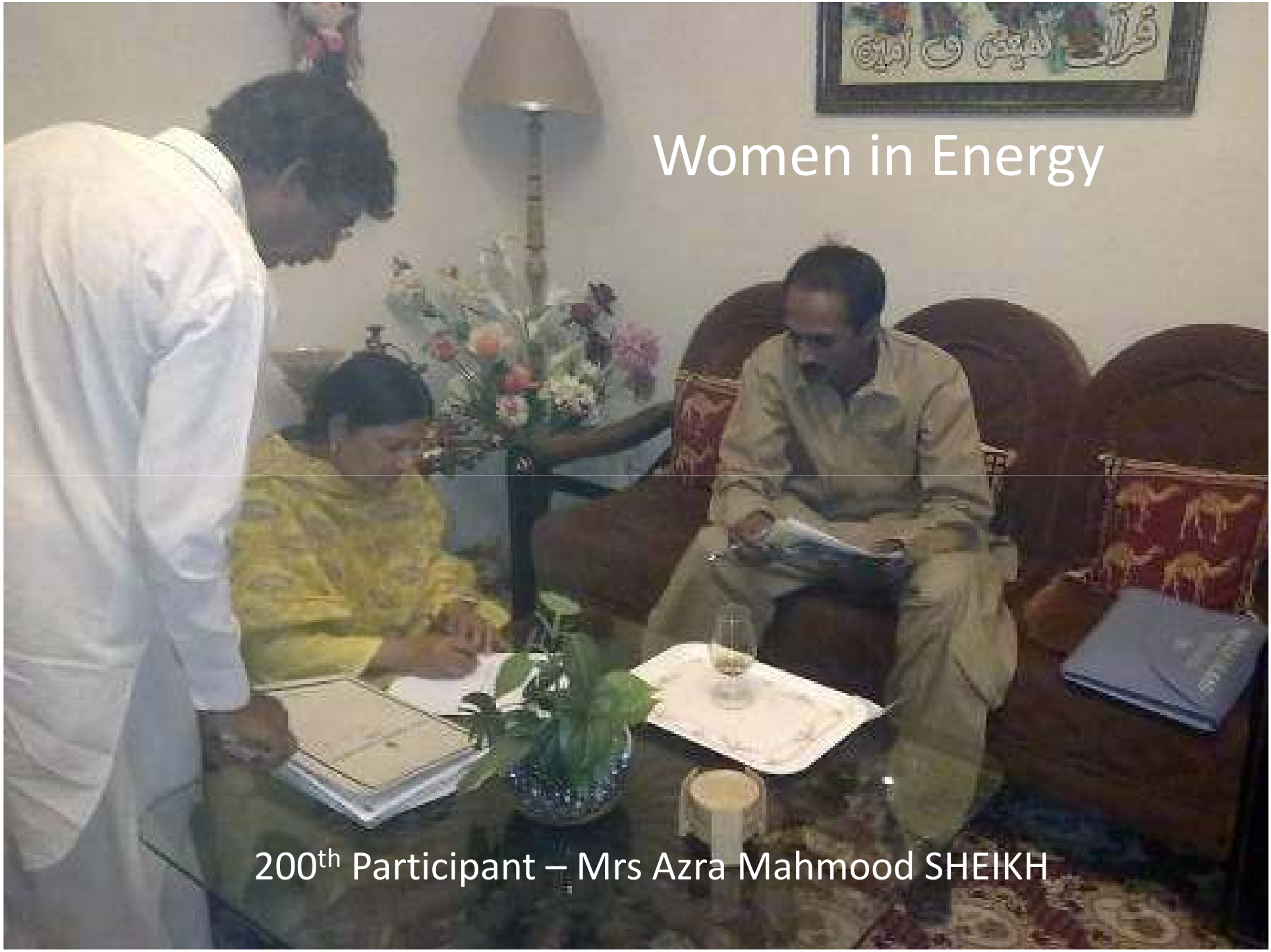
TWEIP Energy Savings

		Pre Audit		Post Audit		Savings	
	No of Audits	Average Energy Consumption per Pumpset (kW)	Average Pumpset Energy Efficiency (%)	Average Energy Consumption per Pumpset (kW)	Average Pumpset Energy Efficiency (%)	Total Energy Demand Savings (MW)	Total Energy Consumption Savings (MWh)*
Total Replaced	152	18.28	36.67	12.95	53.37	0.81	2,960
Total Orders	240	18.28	36.67	12.95	53.37	1.28	4,674
PILOT Target	1,000	18.28	36.67	12.95	53.37	5.33	19,455
TWEIP Target	11,000	18.28	36.67	12.95	53.37	58.69	214,221

A newly installed Turbine Pump system. This farmer has four pumps and has recently diversified into growing vegetables and fruit under plastic covered hoops (a new concept for this area)


Women in Energy
200th Participant – Mrs Azra Mahmood SHEIKH

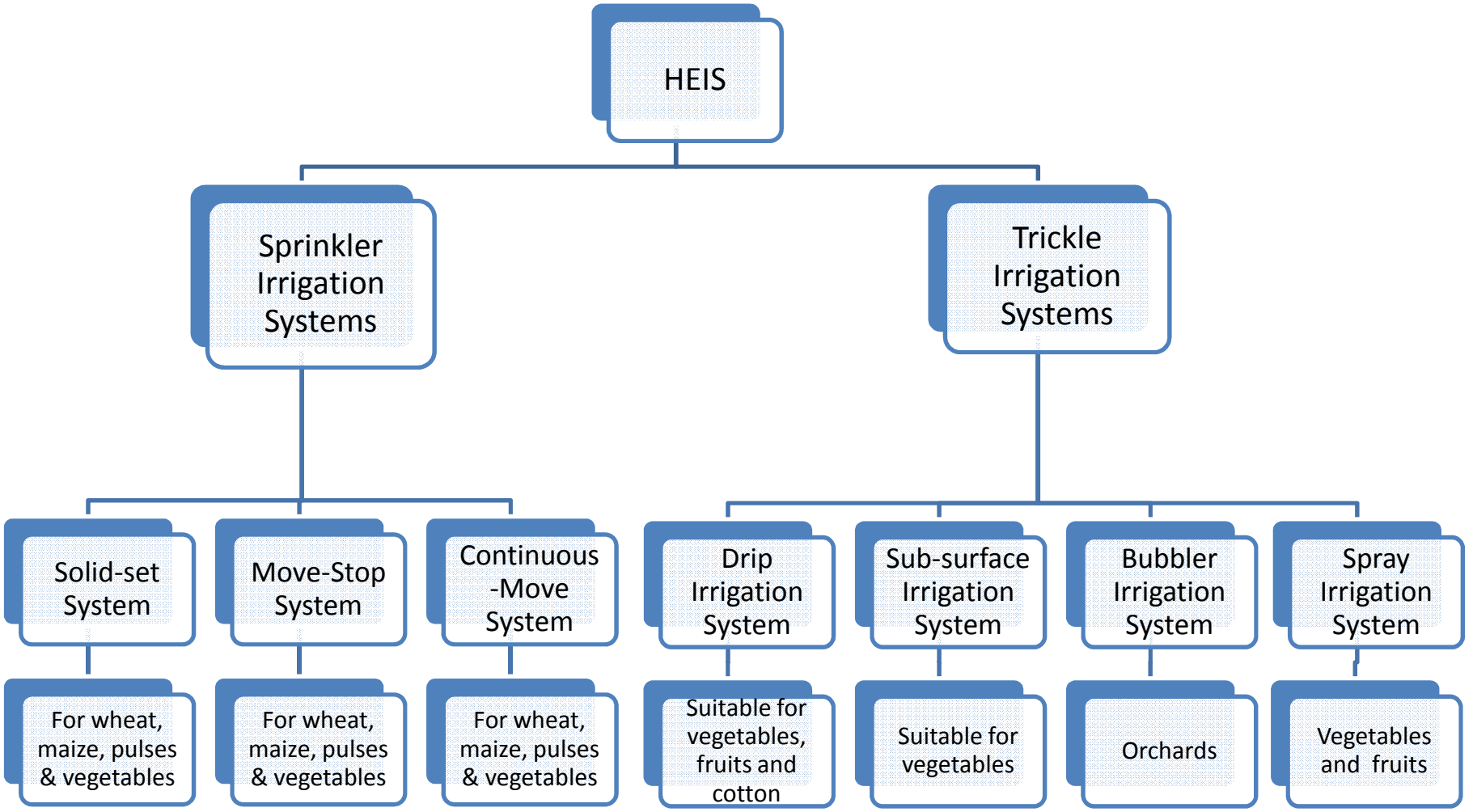
HIGH EFFICIENCY IRRIGATION SYSTEMS (HEIS)

USAID | PAKISTAN
FROM THE AMERICAN PEOPLE

Wasted Water is Wasted Energy

30% Evaporation
20-40%Run-Off &
Seepage Loss

Typical farmland irrigation channels into local fields (this one in need of repair)


HEIS
Sprinkler Irrigation Systems
Trickle Irrigation Systems
Solid-set System
Move-Stop System
Continuous -Move System
Drip Irrigation System
Sub-surface Irrigation System
Bubbler Irrigation System
Spray Irrigation System
For wheat, maize, pulses & vegetables
For wheat, maize, pulses & vegetables
For wheat, maize, pulses & vegetables
Suitable for vegetables, fruits and cotton
Suitable for vegetables
Orchards
Vegetables and fruits

Introduction

Most of the land area of Pakistan is classified as arid to semi arid because rainfall is not sufficient to meet the crop water requirements.

To meet the irrigation water requirements, supplemental irrigation technology were introduced. As the overall agricultural production depends on efficient use of scarce water resources outside the Indus basin, the government of Pakistan realized to introduce highly efficient irrigation technologies (Sprinkle and Trickle Irrigation systems) to utilize limited resources of water optimally and efficiently.

Sprinkle Irrigation Systems

Sprinkle Irrigation system is a type of irrigation, in which water is supplied to the field in the shape of rain drops and showers. This system maximizes efficiency and minimizes labor and capital costs, and at the same time provides favorable environment to plant growth. They are recommended for varying soils, topography and crops. Flexibility and efficient water control permitted a wide range of soils to be irrigated which can not be brought under irrigation through conventional surface irrigation methods, and thus allowing more lands to be irrigated.

Types of Sprinkle Systems

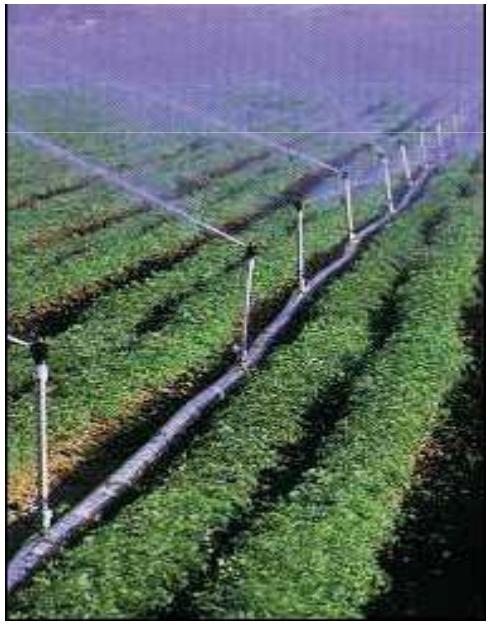
Sprinkle systems can be classified in such a way as portability and can be classified in three general classes as below:

1. Solid set System
2. Move-stop system
3. Continuous move system

Solid-set System

A sprinkle system, which remains in a single location during an irrigation season and supplied water by a fixed network of pipes called Solid-set System.

Solid-set Systems irrigate the entire field with a single set of components and are, therefore, more costly than other systems. The labor and maintenance requirements of Solid-set are minimal, but cultural operations such as cultivation, spraying, planting and harvesting may be restricted. As a result, Solid-set Systems are mostly applicable for crops with minimum cultural practices requirements.



Move-stop Systems

Move-stop System are designed to move the lateral pipelines from set to set. The movement itself can take on any form from the hand move lateral to the tractor-towed lateral; hence, the common use of names like hand move, end tow and side roll sprinkle systems.

Move-stop Systems require more labor and maintenance than Solid-set Systems, but are less expensive to purchase and install. Energy requirements are approximately equivalent.

Continuous-move System

A remedy to the labor, maintenance, and downtime problems with move stop systems is the system that covers the irrigated area by continuously moving.

Center-pivot, Linear-move, and Big-gun systems are typical examples of the continuous move concept.


Pivot System

Trickle Irrigation Systems

Trickle irrigation is a system where water and fertilizer are applied directly to individual plants, instead of irrigating the entire area with sprinkle and surface irrigation systems.

Types of trickle irrigation system

Trickle irrigation encompasses several methods of irrigation, including

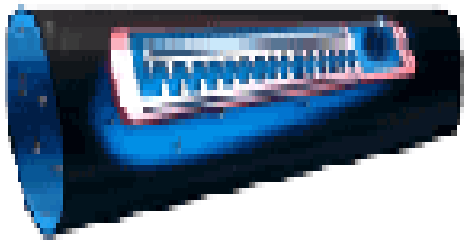
1. Drip,
2. Sub-surface,
3. Bubbler, and
4. Spray irrigation.

Drip Irrigation

Drip Irrigation is the slow, nearly continuous application of water as discrete drops. Water can be applied at a single point (small wetted area) on the land surface through devices called emitters or as a line source from either closely spaced emitters or tubes with continuous or equally spaced openings that discharge water a drop at a time. Discharge rates for point source emitters are generally less than 12 l/h (3 gph) and less than 12 l/h per meter (1 gph per foot) of lateral for line source emitters.

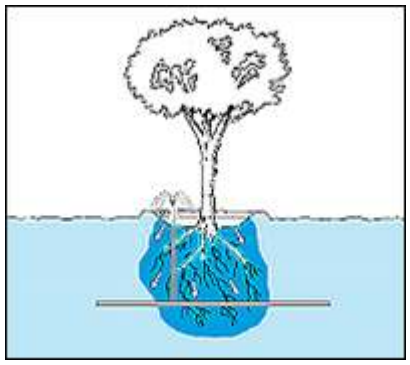
Sub-surface Irrigation

Sub-surface irrigation involves the use of point and line source emitters to apply water below the soil surface.



Bubbler Irrigation

In bubbler irrigation, water is applied to the land surface as a small stream. Water is delivered to the point of application in tubes that are attached to buried laterals. The tubes may be as large as 10 mm (about 3/8 in) in diameter or more. The rate of discharge from each tube is controlled by varying the tube diameter and/or length. Because of large diameter tubes, bubbler systems are not as prone to clog and normally have higher discharge rates than drip and sub-surface systems. Discharge rates are , however, generally less than 225 l/h (1 gpm).



Spray Irrigation

In spray type trickle systems, small sprinkler like devices (often called micro-sprinklers) spray water as a mist over the land surface. Spray-type trickle systems are less likely to clog than are drip and sub-surface systems. Micro-sprinklers can be spaced to cover the entire land surface as with conventional sprinkler systems . Discharge rates are usually less than 15 l/h (0.5 gpm).

END