

Prefab DEWATS

Prefabricated Decentralized
Wastewater Treatment Systems

Lessons Learnt from Afghanistan, Indonesia and India



Body of Knowledge BOK Spring 2016

Draft for Discussion

Overview

Prefab-DEWATS is an initiative started by BORDA in Indonesia (2006). To date, BORDA has directly supported the establishment of four production facilities for Prefabricated DEWATS.

Promotion and dissemination of Prefab-DEWATS is seen as an important pillar in BORDA's overall portfolio. Piolet projects have been a key step towards this goal.

The purpose of this document is to provide an overview of the key lessons learnt from three Prefab-DEWATS programs in a) Afghanistan b) India and c) Indonesia. The information on each programme is presented in a question and answer format. The analysis focuses on four critical aspects of a Prefab-DEWATS programme;

1. Technical design and performances,
2. Production process and production facilities,
3. Dissemination and market development,
4. Portfolio and network.

The information has been generated through a survey that was developed in BORDA HQ and was completed by key staff in BORDA's regional offices in Afghanistan, India and Indonesia.

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Technical Design and Treatment Performance

		Afghanistan	India	Indonesia
A	Module	Volume		
Technical designs chosen	Biogas	7 m ³	3 m ³	6 m ³
	Large vessel	13 m ³	13 m ³	13 m ³
	Medium vessel	7 m ³	Not being used	7 m ³
	Small vessel	6 m ³	7.5 m ³	6 m ³
	Grease trap			
Material	Resin, hardener, gelcoat, fiber mat, thinner, topcoat, cobalt, PVA, pigment			
Combinations of modules used				
		ABR – ABR and one settler	<p>Biogas Settler: 3-4 m³/day¹, liquid and sludge storage volume: 4.65 m³, gas storage volume and free board: 1.54 m³, usable gas volume (based on the volume of extension chamber): 0.69 m³</p> <p>Small vessel: Used as a settler for a max wastewater quantity of 7.5 m³/day</p> <p>Medium vessel: Not used</p> <p>Large vessel: used as a) stand alone ABR, b) an integrated settler and ABR with maximum treatment capacity of 7.5 m³/day (with defined design parameter)².</p>	<p>ABR – 6 ABR and one settler, 10 m³/day, RFP</p> <p>ABR – 3 ABR, 6 m³/day, RFP</p> <p>AF – 1-2 chamber 6-10 m³/day, filter: bioball, RFP</p> <p>Biogas Settler: Treatment capacity: 6 m³/day</p> <p>DEWATS support components: Grease trap for 1-2 HH and 3-5 HH and Control boxes.</p>
B		ASWES Ariana Safa Wastewater Engineering Services	CDD Society for DEWATS Dissemination	Haindl BEST/LPTP
	Institutions and or companies involved in design process			

¹ With desludging period of 18 - 24 months

² Option b) is chosen most of the time as it is more cost effective, however has reduced treatment efficiency in comparison to stand alone settler (small vessel) and ABR (large vessel). Modification in the standard design is opted for integrated settler + ABR.

Technical Design and Treatment Performance

	Afghanistan	India	Indonesia
<p>C</p> <p>Main lessons learnt from the technical design process</p>	<p>In Afghanistan, the process of prefabrication is quite costly therefore local prefab partner ASWES, minimized costs by fabricating only a few vessel sizes and deviating from the combined modular approach. The result of this was poor treatment performance – larger vessels should have been used and/or bigger settling modules should have been incorporated. There are plans to remove the 1st ABR compartment of already installed prefabs to increase settler volume.</p>	<p>As stand alone units, prefabs do not comply to the Indian discharge standards. Currently it is difficult to market prefabs as packaged unit as they are often out-competed by other mechanical treatment technologies. Our experience is it is a suitable alternative to civil construction for certain volumes of wastewater treatment, when the client does not want to go with the civil construction or are in a hurry to construct the treatment system.</p> <p>There is a need to understand the reasoning behind the current prefab volume, size, design capacity. This is not clearly understood past the reason of ‘ease of transport’, information on this would be helpful. Designers from different regions should elaborate on this³.</p>	<p>All fine, good communication, well arranged.</p>
<p>D</p> <p>Design needs</p>	<p>A bigger grease trap design is required.</p>	<p>An expert team comprising of designers and installers need to discuss and define clearly the criteria outlined below with regards to DEWATS-Prefab⁴.</p> <p>Additionally, there is a need to identify an alternative tertiary treatment to the PGF and offer a factory made system that will ensure discharge standards are met. The Vortex may be a viable option. If this tertiary treatment is available, marketing DEWATS-Prefab would be a lot easier.</p>	<p>A HGF filter module is required.</p>

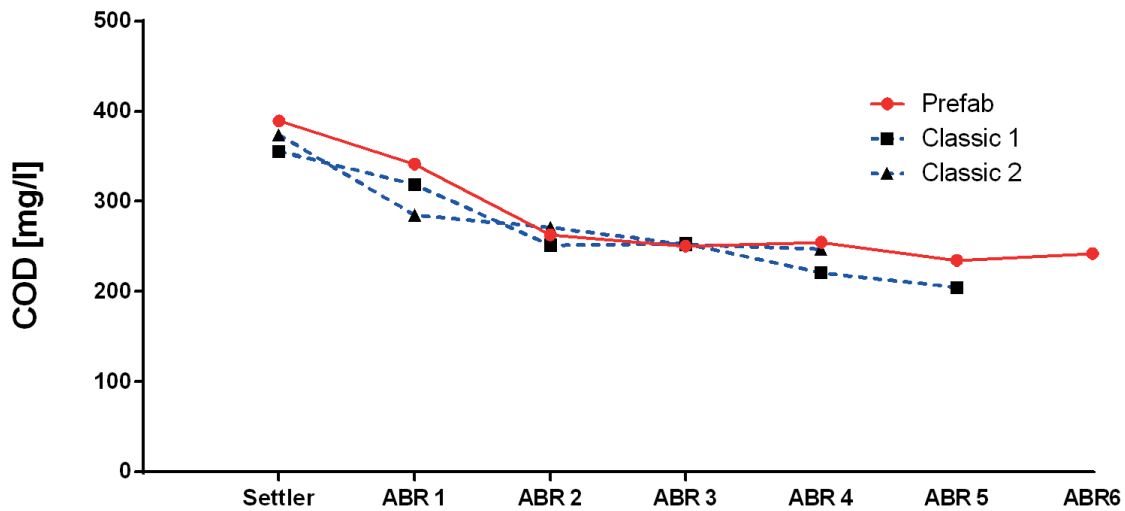
³ Suggested discussion points on Prefab-DEWATS design; What is the basis by which we select modules; What are the discharge standards you need to comply with?; What are the different combinations the different regions have adopted and why?; What are the modifications need to be made to existing designs etc.?

⁴ a) design capacity, b) design parameter to be considered, c) sector of application e.g. i. the peak flow of wastewater from the factory V’s household is very different, however the volume may be same per day – this has implications on the treatment efficiency; ii. if the prefab module is used for community toilet wastewater- with high concentration- the retention time available using this module may be very limited resulting in no or less treatment; iii. combination of modules, iv. change or modification in the existing designs and detailing within the module e.g. height of baffle wall, partition wall, openings, location of manhole, module installation procedure, etc.), v. proposing or adoption of packaged tertiary treatment, vi. use of modules for other application like septage treatment e.g. In India presently we are offering the packaged septage treatment facility which includes use of prefab modules.

	Afghanistan	India	Indonesia
E			
Treatment performance – empirical data	Similar to DEWATS conventional with effluent records between 350-800 mg/l COD.	Effluent records between 140-100 mg/l COD.	Similar to DEWATS conventional, however some systems are often overloaded due to mistakes in LG design process/illegal household connections (data graphed below).

Data from Indonesia⁵

Figure 1 Comparison of Prefab and classic construction DEWATS systems



⁵ Indonesia is the only country with 12 months of data that can be analyzed – data: BORDA RnD - Bjoern Pietruschka.

Production Processes and Production Facilities

	Afghanistan	India	Indonesia
<p>A</p> <p>Are existing production capacities sufficient to meet existing/ upcoming demand for Prefab-DEWATS systems?</p>	<p>Current demand is almost non-existent and current production has ceased.</p>	<p>Current capacity is adequate to meet demand.</p> <p>CDD produces 50 vessels per month, with the potential to increase to 100.</p> <p>There is a need to increase sales.</p> <p>Presently the cost of selling is a little high and clients feel it is expensive. However, when the cost is compared with other costs associated with civil construction and the time required for construction, the higher cost of prefabs may be justified, at this stage convincing the client is difficult.</p>	<p>Production facilities have been upgraded by local investors. The initial BORDA start up money would not be sufficient to set up a sustainable prefab production facility⁶.</p>
<p>B</p> <p>Does the program have plans to increase production capacities?</p>	<p>No plan to increase production.</p>		
<p>C</p> <p>Does the program have plans to enter strategic agreements with (private) sector players?</p>	<p>Yes, currently the prefab facility is being managed completely by a local private sector partner.</p>	<p>Yes, currently some of our partners are buying prefabs from us to implement in WWT projects.</p> <p>There are plans to explore franchising or a full time selling organisation⁷.</p> <p>Prefabs are being trialled as components to a septage treatment facility⁸ - If they are found to be successful, further private sector partnerships will be sought.</p>	<p>No, except the involvement of local investors which is already on-going⁹.</p>

⁷ BORDA-SA and CDD Society has hired a business consultant to prepare the business strategy which may be implemented from 2016. Presently the sales and marketing team of CDD Society are selling prefab units as per the enquiry from the market.

⁸ At CASS campus.

⁹ The ex Ministry of Public Works Director helped to gain market access and sustain quality in a cheap price and low quality driven market.

Dissemination and Market Development

	Afghanistan	India	Indonesia
A How many prefab systems implemented?	17 Prefab-DEWATS for WWT 3 Biogas-prefab ¹⁰ .	2 Prefab-DEWATS demonstration projects for WWT ¹¹ and one septage treatment plant.	2 Prefab-DEWATS demonstration projects ¹² (1 SSS and 1 CSC).
B Main obstacles for the commercialization of prefab	The main obstacles are largely country specific e.g. fragile security situation, a collapsing economy and dysfunctional construction industry. Additionally, in Afghanistan, prefabs are out-competed by conventional DEWATS in cost per cubic meter of WW treated, treatment efficiency and the capacity of WW / treated.	The main obstacle is that prefabs without tertiary treatment, do not meet effluent standards ¹³ . Cost per cubic meter is similar if not more than the conventional mechanical treatment which promises full treatment. Weak or non-existent sales strategy.	The market demands lower costs, which means lower quality. Commercialisation of prefabs needs “governmental insiders” involved in shares to facilitate market access. It requires excess capital to bridge the time between production and storage until time of sale if serving governmental programs. Corruption can be a problem. Misapplication of prefab by customers can be an obstacle ¹⁴ .
C Are there any strategic partners for the commercialization of the system (private, public)?	Yes, one local production facility owner - ASWES. There has been some interest from UN agencies, Ministry of Urban Development, however Green Economy in Afghanistan is currently dysfunctional with little private investment.	No external partners yet however, there are some interested companies.	Marketing companies who are committed to quality of implementation, including CBO establishment and coaching of LG's in design and training.

¹⁰ For rural energy production and WWT.

¹¹ Locations: Kamal Solar Factory and Positive Label.

¹² These were important in order to obtain approval (accreditation) from Government of Indonesia.

¹³ As prescribed by the pollution control board in India.

¹⁴ E.g. No CBO established for operation and maintenance, and wrong designs implemented by local government.

Dissemination and Market Development

	Afghanistan	India	Indonesia
<p>D</p> <p>Parameters that should be addressed by a comprehensive dissemination and marketing strategy for Prefab-DEWATS systems.</p>	<p>Full analysis of the market niche in the country, diversify market.</p> <p>The 'Made in Germany' quality branding is an important feature.</p> <p>A 'service guarantee' should be incorporated in the strategy.</p> <p>Improved construction quality and reduced construction time is also an important feature.</p>	<p>Identify and address the specific segment of the market where prefab is needed.</p> <p>Mass dissemination is not favourable as prefab is a niche market.</p> <p>Improved construction quality and reduced construction time.</p> <p>Identify and link with various government programmes¹⁵.</p>	<p>Mass dissemination is not favourable.</p> <p>There is a need to provide high quality benchmarking by mobilising resources to provide: trainings, capacity building for QMS in production and sales, linking up of CBS component including strong capacity building for community development, CBO.</p> <p>Consider prefab as an ad-on component in the DEWATS dissemination, to showcase quality prefab flagship examples even if there is not much on extension¹⁶.</p> <p>Involve governmental decision makers in sales and marketing.</p> <p>Stay 'below the radar' in the system, if visibility is too high it may encourage competitors.</p> <p>More funds should be mobilised for Prefab-DEWATS¹⁷ programmes.</p> <p>Diversify client base, where possible¹⁸.</p>

¹⁵ E.g. Linking with Public toilet waste treatment under Swatch Bharat program.

¹⁶ Additional comment on dissemination "100 good systems are better than 2,000 bad systems".

¹⁷ Approximately 600,000 - 1 Million US\$ can allow proper production, stock keeping and serving LG programs.

¹⁸ In Indonesia its only LG program, which is sufficient for the BORDA programme but requires involvement of other sponsors/ investors to bridge financing gap.

Portfolio and Network

	Afghanistan	India	Indonesia
<p>A</p> <p>What is the role of the regional program to promote Prefab-DEWATS systems in the future?</p>	<p>The prefabrication facility currently has a stockpile of unsold prefabs that are available to the region, there is a need to market these for emergency use or other projects.</p> <p>From the beginning of 2016, the BORDA Afghanistan programme will discontinue to implement and also subsidize the implementation of DEWATS, this will leave a gap for the private sector to fill.</p> <p>BORDA will continue to promote prefabs, highlight areas where training is needed, and further develop a general DEWATS QMS.</p> <p>Monitoring of existing systems.</p>	<p>To explore what improvements are required to meet the treatment efficiency.</p> <p>To strategize on how to optimise cost of production and implementation.</p> <p>To assess the client base.</p> <p>Research and propose alternative materials.</p> <p>Identify alternative funding sources.</p>	<p>Provide benchmarking for prefabs.</p> <p>Combine with community development trainings and TOT.</p> <p>Monitoring and CBS – CBO networking (e.g. AKSANSI)¹⁹.</p> <p>Research and development on:</p> <ul style="list-style-type: none"> – storm water bypass – tertiary treatment <p>Quality Management of prefabs is key. BORDA should position itself as the leader in innovative technologies and introduce prefabs to the market but maintain control on the dissemination process to avoid corruption or misuse of the service packages by uncontrolled production companies and distributors.</p>
<p>B</p> <p>Recommendations for the promotion of Prefabs – What should be done?</p>	<p>A QMS is urgently needed for prefabs.</p> <p>A stronger knowledge sharing between regions is needed.</p> <p>Prefab private and public partners should be engaged by BORDA at least twice a year to share knowledge and learnings.</p>	<p>Support is required to present Prefab-DEWATS to International Organizations.</p> <p>Strengthen knowledge generation and sharing throughout the regions.</p> <p>Develop a COP for partners working in the production and implementation of prefabs.</p> <p>Research and development on:</p> <ul style="list-style-type: none"> – what improvements are needed to meet different levels of treatment efficiency. – the potential of alternative materials suitable for prefab. 	<p>Benchmarking for prefabs.</p> <p>Monitoring and CBS – CBO networking (e.g. AKSANSI).</p> <p>Combine prefabs into community development trainings and TOT.</p> <p>Research and development on:</p> <ul style="list-style-type: none"> – storm water bypass – tertiary treatment <p>Quality Management of prefabs is key. BORDA should be the leader in innovative technologies and introduce prefabs to the market but maintain control on the dissemination process to avoid corruption or misuse of the service packages by uncontrolled production companies and distributors.</p>

¹⁹ AKSANSI (Asosiasi KSM SANIMAS Seluruh Indonesia) established in 2005 is an Association of Community Based Organization (CBO) Sanitation throughout Indonesia.

Portfolio and Network

	Afghanistan	India	Indonesia
<p>C</p> <p>Three major fields of cooperation for the BORDA network for an improved promotion of Prefab-DEWATS systems</p>	<p>Cooperation with players in the refugee crisis²¹:</p> <ul style="list-style-type: none"> - UNHCR - UNICEF - Oxfam - ACTED 	<p>Overview of treatment efficiency – results from the different regions.</p> <p>Production management.</p> <p>Approaches to developing and managing a solid client base.</p>	<p>QMS in production.</p> <p>QMS and training in application locations²².</p> <p>Research and development on how to feed new technology into prefab production and distribution combined with monitoring. This will give an opportunity for integrated private sector involvement and will also be accessible for the BORDA programme and increase visibility.</p> <p>Provide high quality products to support various regional applications (e.g. resettlement in Philippines etc.) or emergency distribution from Dubai.</p>
<p>D</p> <p>Recommendations – What should not be done:</p>	<p>Avoid the establishment of further prefab factories in new regions/ countries without understanding of the local market and assessment of the demand.</p> <p>BORDA should not neglect importance of unified / accessible QMS.</p>	<p>Promotion of prefabs as a complete treatment (as they are not meeting standards in India).</p> <p>Run the prefab factory on their own – should be out sourced.</p>	<p>Act as shareholder - this would significantly increase the effectiveness of BORDA's programme in the country²³.</p> <p>Push for high sales numbers - this would conflict with the need for QMS and benchmarking and will not compete in the existing market with regard to pricing structure.</p>

²⁰ Prefabs are suitable for emergency and refugee camp situations as they can be considered as 'non-permanent structures'.

²¹ Mainly training of supervisors, support training of community facilitators at LG. E.g., without SANFAB the Indonesian prefab market would be that much more corrupted, such that it could be considered failed. But we still provide good quality examples of prefab implementations, however it is still a concern that the market will be infiltrated by low quality products.

²² Indonesia

Additional Information

Afghanistan	India	Indonesia
<p>BORDA should make a consolidated effort to present and promote Prefabs to International Organizations.</p> <p>Support²³ should be made available to Prefab fabricators and implementers internationally.</p> <p>An improved knowledge exchange is needed with BORDA, prefab partners, factory owners and implementer²⁴.</p>	<p>There is an urgent need for an improved information sharing and communication strategy between the regions on Prefab-DEWATS.</p>	<p>There is a need to explore how to officially establish prefabs as an ad-on component in up-scaling of DEWATS dissemination. It is important to avoid up-scaling in a commercial manner with investors and shareholders who will drain the cash flow in the tight emerging sanitation market and will flood the market with lower quality and low cost units. The up-scaling component should involve local partners.</p> <p>Elaborate options for market development (not for our own products but for a healthy market where Prefab-DEWATS can be part of).</p>

²³ E.g. with trainings, design modifications, improvements and sharing of lessons learnt.

²⁴ E.g. A half yearly Skype meeting

Acronyms

HGF
Horizontal Gravel Filter

PGF
Planted Gravel Filter

GFK
See FRP

FRP
Fibre Reinforced Plastic

WWT
waste water treatment

SSS
Shallow Sewer System

CSC
Community Sanitation Centre

LG
Local government

CBO
Community based organisation

QMS
Quality Management System

COP
Community of practice

TOT
Training of Trainers

UNHCR
United Nations High Commissioner for Refugees

UNICEF
United Nations International Children's Emergency Fund

ACTED
Agency for Technical Cooperation and Development