

Producing transparent results through appropriate QA/QC, data organization and storage

3rd Faecal Sludge Management Conference, Hanoi, Vietnam
Workshop 4: FSM systems approach for implementation and operation
22.01.2015

Moritz Gold*

*Eawag: Swiss Federal Institute of Aquatic Science & Technology, Sandec: Department of Water and Sanitation in Developing Countries, P. O. Box 611, 8600 Dübendorf, Switzerland

Key Objective (3)

Learn to apply quality assurance and quality control (QA/QC) measures, as well as data organization and storage to produce more transparent results along the entire faecal sludge sampling chain.

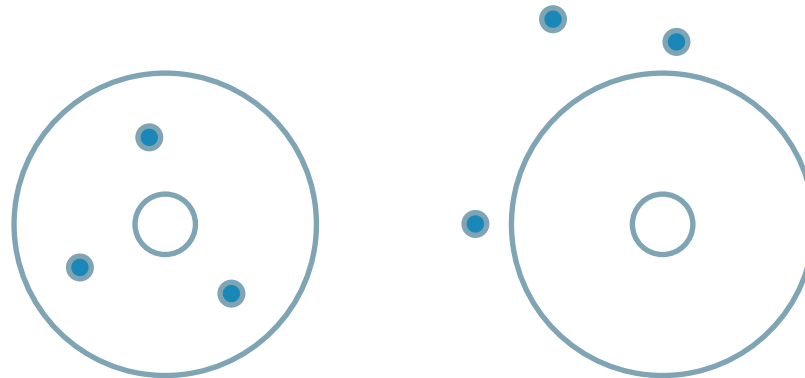
Three main points

1. What is QA/QC and why is it important?
2. Examples of good and bad QA/QC?
3. How to implement QA/QC in the field and laboratories?

Terminology

Is your sampling and analysis precise and/or accurate?

	Crucible empty (g)	Crucible + wet sample (g)	Crucible + dry sample (g)	Total solids (wt%)
1	28.2720	52.9536	29.4978	5.0
2	24.0954	37.9876	25.3079	8.7
3	22.3725	41.9527	23.6988	6.8
				6.8 ± 1.9



QA/QC measures are those activities you undertake to demonstrate the **accuracy** and **precision** of your monitoring.

Quality assurance and quality control (QA/QC)

Quality assurance

- Broad plan for maintaining quality in all aspects of your program.
 - ✓ Study design.
 - ✓ Documentation of entire sampling and analysis procedures.
 - ✓ Personal responsibilities.
 - ✓ Training of staff.
 - ✓ Data management.
 - ✓ Chain of custody.
 - ✓ Data assessment.
 - ✓ Standard operating procedures (SOPs).
 - ✓ Quality control (QC) measures.

Quality assurance and quality control (QA/QC)

Quality control (QC) - internal

- Quality assessment of the specific precision and accuracy of your data.

QC tool	Description	Main purpose
Field blanks	A sample of deionized water which is treated as a sample.	Identify errors or cross-contamination during sample collection and analysis.
Field replicates	An additional sample which is taken at the same time and place.	Estimate sampling precision.
Lab replicates	A sample that is split in subsamples at the lab for separate analysis.	Estimate sampling precision.
Calibration blank	A calibration blank is deionized water processed like any of the samples and used to "zero" the instrument.	Identify drifts of the analysis device.
Calibrations standard	Standard concentration to set the correct relationship between indicator and measurement results.	Ensure analysis accuracy.

Quality assurance and quality control (QA/QC)

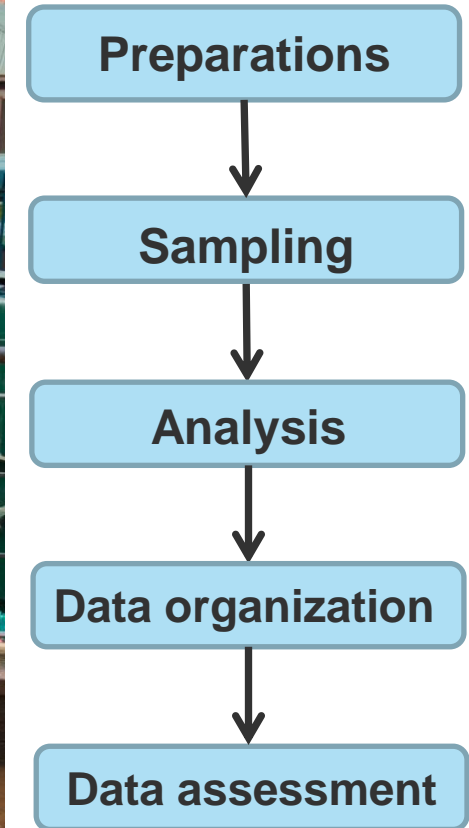
Quality control (QC) - external

- Quality assessment of the specific precision and accuracy of your data.

QC tool	Description	Main purpose
External field replicate	A sample which is collected by an external lab at the same time and place as the internal lab and analyzed by the external lab.	Estimate sampling and analysis precision.
Split sample	A sample that is split into two subsamples in the lab and analyzed in an internal and external lab.	Estimate analysis precision and accuracy.
Knowns/ Unknowns	The external lab sends samples for selected parameters with concentrations known/unknown by the internal lab. These samples are analyzed and the results compared with the known concentrations.	Estimate analysis precision and accuracy.
External analysis of duplicate sample	Either internal or external field replicate is analysed in an external lab and compared with the results of the internal lab.	Estimate analysis precision and accuracy.

QA/QC

Practical experiences from Dakar and Kampala



Practical experiences from Dakar and Kampala

Preparations



Laboratory training

No.	Equipment	Description	Number/Quantity
1	PH & EC Meter	Meter unit with a PH and EC probe	1
2	Unused pipettes	1- 5ml	1
4		0.2 - 1ml	1
5	Used pipettes	1- 5ml	1
6		0.2 - 1ml	1
7	Unused reaction tubes	Complete with red covers	4
8	Used reaction tubes	Complete with red covers	21
9	Safety goggles		2
10	Microfiber filters	Unused packs	2
11		Half-used packs	1
12	Timer (clock)	Digital	1
13	Pipette tips	BBP 068 - unused boxes	6
14		BBP 070 - unused boxes	3
15		Used BBP 068 and BBP 070	Hundreds
16	Plastic filter holders	Unused	1
17		Used	1
18	Plastic syringe	20ml capacity	1
19	Thermostat	LT 200 in great working condition with cables and attached plugs	2
20	Spectrophotometer	In great working condition	1
21	Crucibles	25ml capacity	32
22	Cooler box	Red - 10 litre capacity	1
23	Ice cooler packs	Blue	4
24	Sampling bottles	White with green lids - approx 0.6litres capacity each	12
25	Wash bottle	Approx. 1 litre capacity	1
26	Spray bottle	About 0.8 litre capacity	1
27	Washing sponge	Unused	1
28		Green - approx 0.03sq. Metres each	2
29	Lab coats	Used, white, large size	1
30	Data Folders	All field and lab analysis results (Blue)	2
31		Lab analysis protocol from UNV (Black)	1
32		Equipment manuals (Green)	1
33	Unused protocol sheets	Different parameters	Many

Management of lab supplies



Management of lab space

Practical experiences from Dakar and Kampala

Sampling



Sampling equipment



Field blanks and replicates



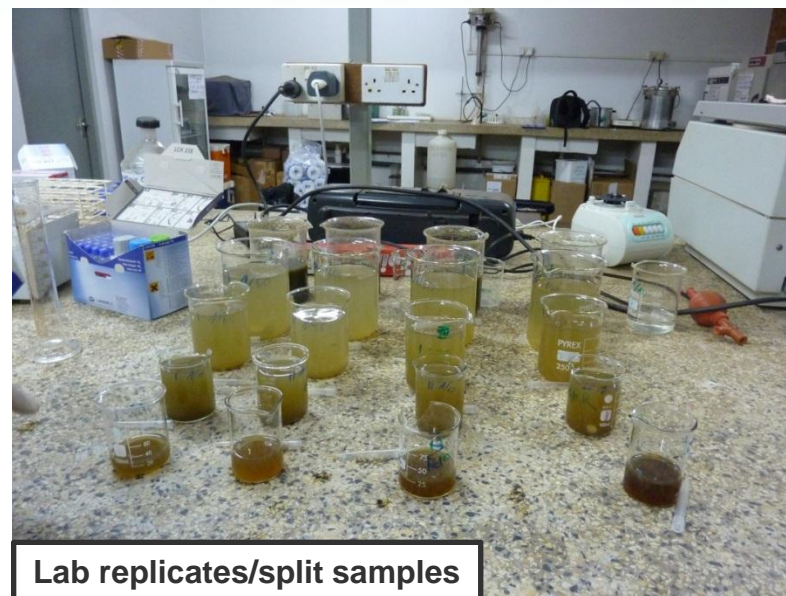
Sample preservation

Practical experiences from Dakar and Kampala

Laboratory analysis

eawag aquatic research		Public Health and Environmental Engineering (PH&EE) Laboratories		Protocol Section D -	Page Nr.	
Sandoz Water and Sanitation in Developing Countries						
Protocol Sheet TS/VS				SOP 013		
Step	Date and Time	Name	Comments			
Sampling	7 th /04/2014	Paul, David, David				
Analysis	8 th /04/2014	Maria				
Data Entry	13.06.14					
Nr.	Label Nr.	units in gram, including all digits an analytical scale				
		dry crucible	V	crucible + wet sample	crucible + dry sample	crucible + burned sample
178	1.1	28.2720	20ml	45.7653	29.4978	28.6760
	2	24.0954	"	41.9755	25.3079	24.5085
	3	22.3725	"	42.0472	23.6988	22.8202
179	4	24.4720	"	42.4060	24.6361	23.1636
	5	23.8033	"	42.4289	23.7799	23.7146
	6	23.7482	"	41.6265	23.9167	23.8507
180	7	23.1763	"	42.6687	23.4537	23.3308
	8	22.0714	"	42.5642	22.3914	22.2532
	9	22.3974	"	41.1072	22.6885	22.5553
10	4.1					
11	4.2					
12	4.3					

Laboratory book



Lab replicates/split samples



Blanks and calibrations

Practical experiences from Dakar and Kampala

Data organization & assessment

20140106_Data_Spreadsheet überarbeitet new FB - Microsoft Excel

	A	B	C	E	G	AG	AH	AI	AJ	
1										
2	Sampling date	Analysis Date	Sample Number	Origin Category	Type	NH4 Dilution	NH4-N 1	NH4-N 2	NH4-N 3	NH4-N
3	28.11.2013	29.11.2013	1	Institutional/Commercial/Industrial	Lined Pit	5	45,10	45,10	45,10	22
4	28.11.2013	29.11.2013	2	Institutional/Commercial/Industrial	Septic Tank	5	49,70	49,60	49,70	24
5	28.11.2013	29.11.2013	3	Public Toilet	Lined Pit	15	118,00	118,00	118,00	177
6	28.11.2013	29.11.2013	4	Multiple Household	Lined Pit	30	83,90	83,80	83,80	251
7	28.11.2013	29.11.2013	5	School	Septic Tank	5	31,50	30,50	30,40	15
8	09.12.2013	10.12.2013	6	Household	Septic Tank	5	67,10	65,70	65,70	33
9	09.12.2013	10.12.2013	7	Institutional/Commercial/Industrial	Septic Tank	-	-	-	-	-
10	09.12.2013	10.12.2013	8	School	Lined Pit	-	-	-	-	-
11	12.12.2013	13.12.2013	9	Multiple Household	Septic Tank	5	101,00	102,00	103,00	51
12	12.12.2013	13.12.2013	10	Household	Lined Pit	20	95,20	95,40	95,50	190
13	12.12.2013	13.12.2013	11	Institutional/Commercial/Industrial	Septic Tank	1	77,60	77,60	77,60	77
14	16.12.2013	17.12.2013	12	Household	Septic Tank	1	87,20	87,20	87,20	87
15	16.12.2013	17.12.2013	13	Multiple Household	Lined Pit	20	75,50	76,10	76,10	151
16	16.12.2013	17.12.2013	14	Multiple Household	Septic Tank	10	101,00	101,00	101,00	101
17	16.12.2013	17.12.2013	15	Multiple Household	Septic Tank	1	50,40	50,40	50,40	50
18	18.12.2013	19.12.2013	16	Multiple Household	Lined Pit	5	83,4	83,00	83,20	41
19	18.12.2013	19.12.2013	17	Multiple Household	Lined Pit	24	94,00	94,10	94,10	225
20	18.12.2013	19.12.2013	18	Institutional/Commercial/Industrial	Septic Tank	10	31,60	31,50	31,60	31
21	02.01.2014	03.01.2014	19	Multiple Household	Lined Pit	20	86,60	86,60	86,50	173
22	02.01.2014	03.01.2014	20	Multiple Household	Lined Pit	10	66,10	66,00	66,20	66
23	02.01.2014	03.01.2014	21	Multiple Household	Lined Pit	20	108,00	106,00	106,00	213
24	02.01.2014	03.01.2014	22	Household	Lined Pit	10	111,00	111,00	111,00	111
25	06.01.2014	07.01.2014	23	Restaurant/Hotel	Septic tank, Lined	3	74,60	74,50	74,50	22
26	06.01.2014	07.01.2014	24	Public Toilet	Septic Tank	10	47,20	47,00	47,10	47
27	06.01.2014	07.01.2014	25	Multiple Household	Lined Pit	10	70,40	70,40	70,50	70
28	06.01.2014	07.01.2014	26	Multiple Household	Septic Tank	5	65,20	65,20	65,20	32
29	06.01.2014	07.01.2014	27	Multiple Household	Lined Pit	10	97,80	97,80	97,80	97
30	08.01.2014	-	28	Public Toilet	Septic Tank	-	-	-	-	-
31	08.01.2014	09.01.2014	29	Multiple Household	Septic Tank	1	100,00	100,00	99,50	99
32	08.01.2014	09.01.2014	30	Multiple Household	Lined Pit	20	80,80	80,80	80,90	161
33	13.01.2014	14.01.2014	31	School	Septic Tank	2	90,80	90,70	90,80	18
34	13.01.2014	14.01.2014	32	Multiple Household	Lined Pit	20	93,30	93,20	93,20	186
35	13.01.2014	14.01.2014	33	Multiple Household	Lined Pit	20	106,00	106,00	106,00	212
36	13.01.2014	14.01.2014	34	Multiple Household	Septic Tank	10	68,30	68,10	68,20	68
37	13.01.2014	14.01.2014	35	Multiple Household	Lined Pit	1	111,00	111,00	111,00	111
38	13.01.2014	14.01.2014	36	Household	Septic Tank	10	27,00	27,10	27,00	27

Take-home messages

1. QA/QC is a indispensable to receive precise, accurate and comparable faecal sludge quantities and characteristics for design and operation of faecal sludge management services.
2. Availability of local resources need to be incorporated into the development of a quantification and characterization study.
3. QA/QC costs time and money which needs to be included from the start in timelines and budgets.

QA/QC for FS?



Acknowledgements

Switzerland

Dr. Linda Strande
Mr. Lars Schoebitz
Mr. Moritz Gold
Mr. Guillaume Clair
Mrs. Pauline Dayer
Mr. Fabian Bischoff

eawag
aquatic research **ooo**

Sandec
Water and Sanitation in
Developing Countries

Uganda

NWSC
Makerere University,
Private Emptier Association

Dr. Charles Niwagaba, Mr. Jafari Matovu, Mr. James Maiteki,
Mr. Francis Okello, Mr. Daniel Ddiba, Mr. Patrick Sekigongo



Senegal

University Cheikh Anta Diop
National Sanitation Utility of
Senegal

Dr. Seydou Niang, Mr. Alsane Seck, Mr. Amadou Gueye, Mr. El hadji
Mamadou Sonko, Mrs. Christine Faye, Mr. Papa Samba Diop, Mr. Mbaye
Mbéguéré

