BEFORE THE WASHINGTON

UTILITIES & TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION,

Complainant,

v.

AVISTA CORPORATION d/b/a AVISTA UTILITIES,

Respondent.

DOCKET NOS. UE-200900 and UG-200901 (*Consolidated*)

PAUL J. ALVAREZ AND DENNIS STEPHENS

ON BEHALF OF THE
WASHINGTON STATE OFFICE OF THE ATTORNEY GENERAL
PUBLIC COUNSEL UNIT

EXHIBIT PADS-20

Avista Response to Public Counsel Data Request No. 215, Attachment A

April 21, 2021

AVISTA CORP.
RESPONSE TO REQUEST FOR INFORMATION

JURISDICTION:	WASHINGTON	DATE PREPARED:	03/05/2021
CASE NO.:	UE-200900 & UG-200901	WITNESS:	Heather Rosentrater
REQUESTER:	Public Counsel	RESPONDER:	Glenn Madden
TYPE:	Data Request	DEPT:	Substation Engineering
REQUEST NO.:	PC - 215	TELEPHONE:	(509) 495-2146
		EMAIL:	glenn.madden@avistacorp.com

SUBJECT: Capital Additions, Test Year (Electric)

REQUEST:

Please refer to Avista's Response to Public Counsel Data Request No. 101 and to Attachment E (Colville Transformer No. 2 Replacement) provided.

a) Provide the cost to replace Colville Transformer No. 2.

b) Provide the age of the oldest transformer currently operating on the Avista system.

c) Provide the age at replacement of the oldest transformer Avista has ever replaced on its system.

d) Provide a count of transformers currently operating on the Avista system for which oil is observable on the outside of the transformer. If this count is not available, estimate the percentage of transformers currently operating on the Avista system for which oil is observable on the outside of the transformer.

e) Provide any internal standard, inspection guide, test, or other document which indicates the amount of observable oil which justifies a transformer replacement.

f) Provide all business cases, worksheets, workbooks, models, cost-benefit analyses, or any other calculations, presentations, requests, standards, other documentation, or industry publications which indicate that oil observed on the outside of a transformer justifies replacement.

g) Has Avista had transformers operate safely and reliably for many years with oil observed on the outside of that transformer?

h) Explain why Avista would not just change out the under-rated switch gear for Colville Transformer No. 2.

i) Provide the most recent Dissolved Gas Analysis (DGA) for Colville Transformer No. 2 (or, alternatively, the last DGA completed on Colville Transformer # 2 prior to replacement).

j) In the event the Colville Transformer No. 2 fails, describe the actions Avista will take to mitigate customer impact (meaning, the prescribed N-1 action).

RESPONSE:

a) Total cost for the Colville Transformer #2 replacement project was $ 680,524.

b) The oldest transformer (Equipment Type: Power Transformer) currently operating on the Avista system is 75 years.

c) The oldest transformer replaced, using current Asset Management (Maximo) information, was 81 years.

d) Avista estimates the percentage of transformers currently operating for which oil is observable outside of the transformer to be 15%.

e) Avista considers many factors when determining the need to replace a transformer based on asset condition, which include, but are not limited to, asset health data, environmental considerations, age, visual inspection, and operating history. PC-DR-101 Attachment E lists the various drivers for this project.

f) See Part (e).

g) Please see part (d) above.

h) Avista evaluates the issues, needs and ultimate scope for each project, and identifies appropriate actions based on the number, range and severity of problems identified. Had the only problem with the subject transformer been identified as an under-rated circuit switcher, then Avista would have limited the project scope to solve that problem. Clearly, that was not the case.

i) See Pd-DR-215 – Attachment A "CLV T2 5067947 TOA Analysis Report".

j) In the event of a transformer failure Avista would have taken advantage of all available options to pick up load with adjacent equipment and feeders (hence the need for available equipment capacity and loadings as described in PC-DR-211). Once those options were fully optimized Avista would either install a mobile transformer and/or replace the transformer as quickly as possible.

Equipment	5067947	**Cooling**	FA
Serial No.	5067947	**Fluid volume**	4941
Apparatus type	TRN	**External ID**	10112815
Owner	Retired	**In service**	False
Region	Retired	**Equipment remarks**	Sudden Pressure Relay, Retired 2018
Substation	Colville 115/13kV	**Tank**	MAIN
Designation	TRANSF #2	**Norms used**	TRN_IEEE_69_288KV
Norms	TRN_IEEE_69_288KV	**Gassing status**	3
Fluid type	OIL	**DGA result**	1/1
Description	Distribution Substation	**Moisture result**	2/1
Manufacturer	WEST	**FQ result**	2/2
Year manufactured	1951	**PCB result**	0/0
MVA ratings	12	**Oil test status**	REVIEWED
Max rated voltage	115	**Reviewer**	RHAWKINS

Dissolved Gas Analysis

Lab Report Number	205617-030	194149-018	190562-003	182819-001	182061-003	
Sample date	2018-04-11	2016-05-23	2015-10-02	2014-07-15	2014-05-30	
Sample temp	30	35	30	60	30	°C
Hydrogen (H2)	8	68	76	**256***	**353*^!**	µL/L
Methane (CH4)	7.0	5.0	5.0	3.0	12.0	µL/L
Ethane (C2H6)	5.0	4.0	5.0	4.0	6.0	µL/L
Ethylene (C2H4)	23.0	25.0	29.0	20.0	29.0	µL/L
Acetylene (C2H2)	0.0	0.0	0.0	0.0	0.0	µL/L
Carbon Monoxide (CO)	180~	103	71	57	98	µL/L
Carbon Dioxide (CO2)	2209	2457	2880	2835	4034	µL/L
Oxygen (O2)	2139	7183	2005	7923	1442	µL/L
Nitrogen (N2)	78484	78109	89105	80757	84978	µL/L
Total heat gas	35	34	39	27	47	µL/L
TDCG	223	205	186	340	498	µL/L
Equivalent TCG	0.185	0.234	0.204	0.519	0.782	%
Total partial press	88.0	88.8	99.7	84.5	95.5	% atm
Est. safe handling limit	10.0	5.4	4.9	4.3	4.3	%
Predicted composite fault gas	41	87	89	267	371	µL/L
Acetylene/Hydrogen (C2H2/H2)	0.0					
CO2/CO	12.272	23.854	40.563	49.737	41.163	
CO/CO2	0.081	0.042	0.025	0.020	0.024	
Oxygen/Nitrogen (O2/N2)	0.027	0.092	0.023	0.098	0.017	
NEI-HC	0.15	0.15				kJ/kL
NEI-CO	3.79					kJ/kL
DGA retest days		730	365	365	90	days
DGA retest date		2018-05-23	2016-10-02	2015-07-15	2014-08-30	
DGA reference days	688.0	234.0	444.0	46.0	395.0	days
DGA result	1	1	1	2	3	
DGA diagnosis				H2	T3	

Symbol legend: !: sharp jump, *: abnormal level, ^: abnormal increment, ~: below min interpretation level

Dissolved Gas Analysis Remarks

No anomalies.

Dissolved Gas Analysis Summary

Variable name	Value	Units	Description
Carbon Monoxide (CO)	180~	µL/L	

co~

Moisture Analysis

Lab Report Number	205617-030	194149-018	190562-003	182819-001	182061-003	
Sample date	2018-04-11	2016-05-23	2015-10-02	2014-07-15	2014-05-30	
Sample temp	30	35	30	60	30	°C
Moisture	16	**27***	7	**44***	**34***	mg/kg
Relative saturation	19	**26***	8	17	**41***	%
Dew point	-6	5	-21	15	9	°C
Moisture result	1	2	1	2	2	
Moisture diagnosis		WET-OIL		WET-OIL	WET-OIL	

Symbol legend: *: abnormal level

Moisture Remarks

The water content of the oil is acceptable.

Fluid Quality

Lab Report Number	205617-030	194149-018	190562-003	182819-001	182061-003	
Sample date	2018-04-11	2016-05-23	2015-10-02	2014-07-15	2014-05-30	
Sample temp	30	35	30	60	30	°C
Diel breakdown D877	**45.0***	**45.0***	**48.0***	**31.0***	**39.0***	kV
Acid number	0.012	0.012	0.012	0.018	0.024	mg KOH/g
Interfacial tension	33.6	33.5	32.6	32.7	32.8	mN/m
Specific Gravity	0.870	0.871	0.871	0.874	0.872	
Color	2.0	2.0	2.0	2.0	2.0	
Oil quality index	0.4	0.4	0.4	0.6	0.7	
Visual	OK	DEBRIS	CLEAR	SEDIMENT	OK	
Fluid quality retest days		730	365	365	90	days
Fluid quality retest date		2018-05-23	2016-10-02	2015-07-15	2014-08-30	
FQ result	2	2	2	2	2	

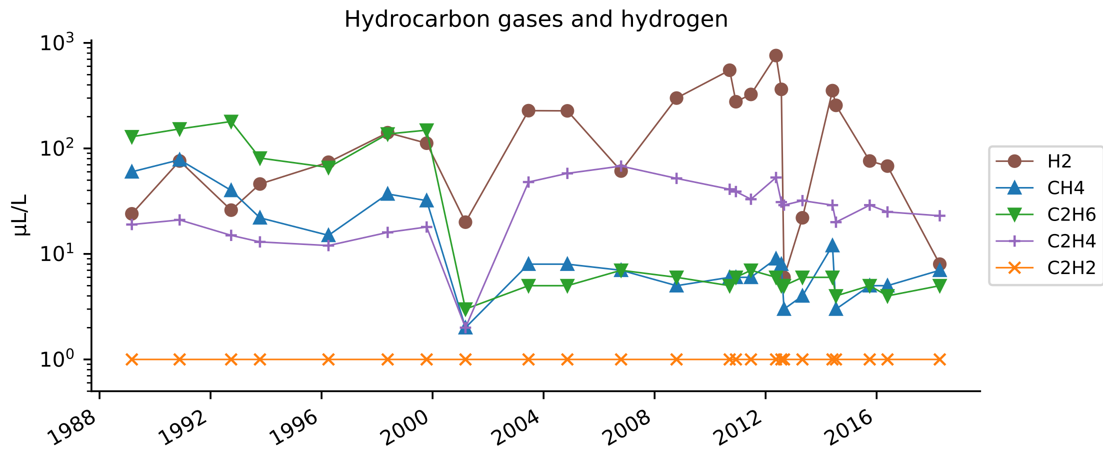
Symbol legend: *: abnormal level

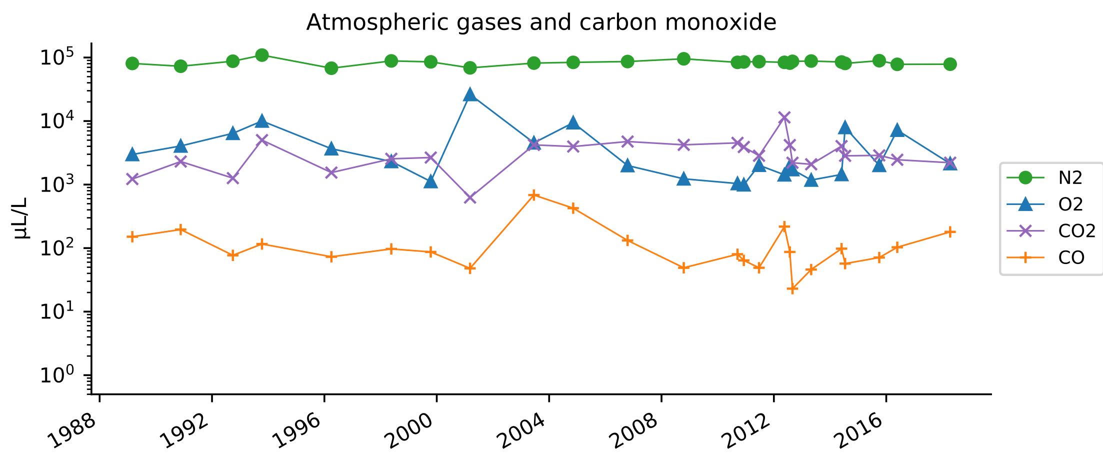
Fluid Quality Summary

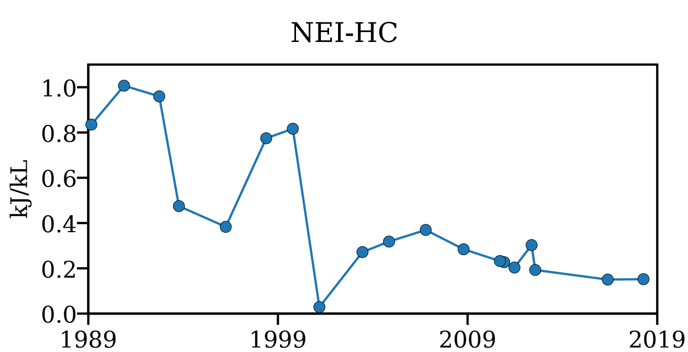
Variable name	Value	Units	Description
Diel breakdown D877	45.0*	kV	Level alert (high 26, low 18).

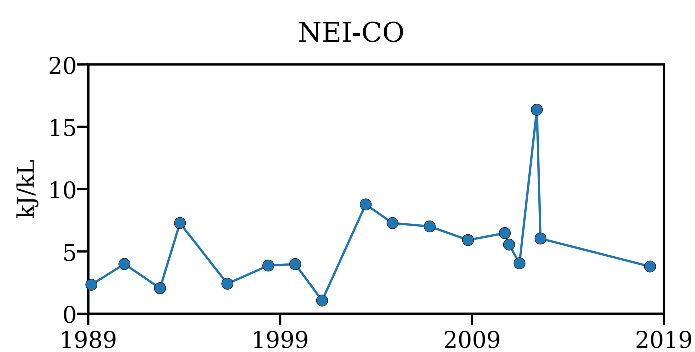
d877*

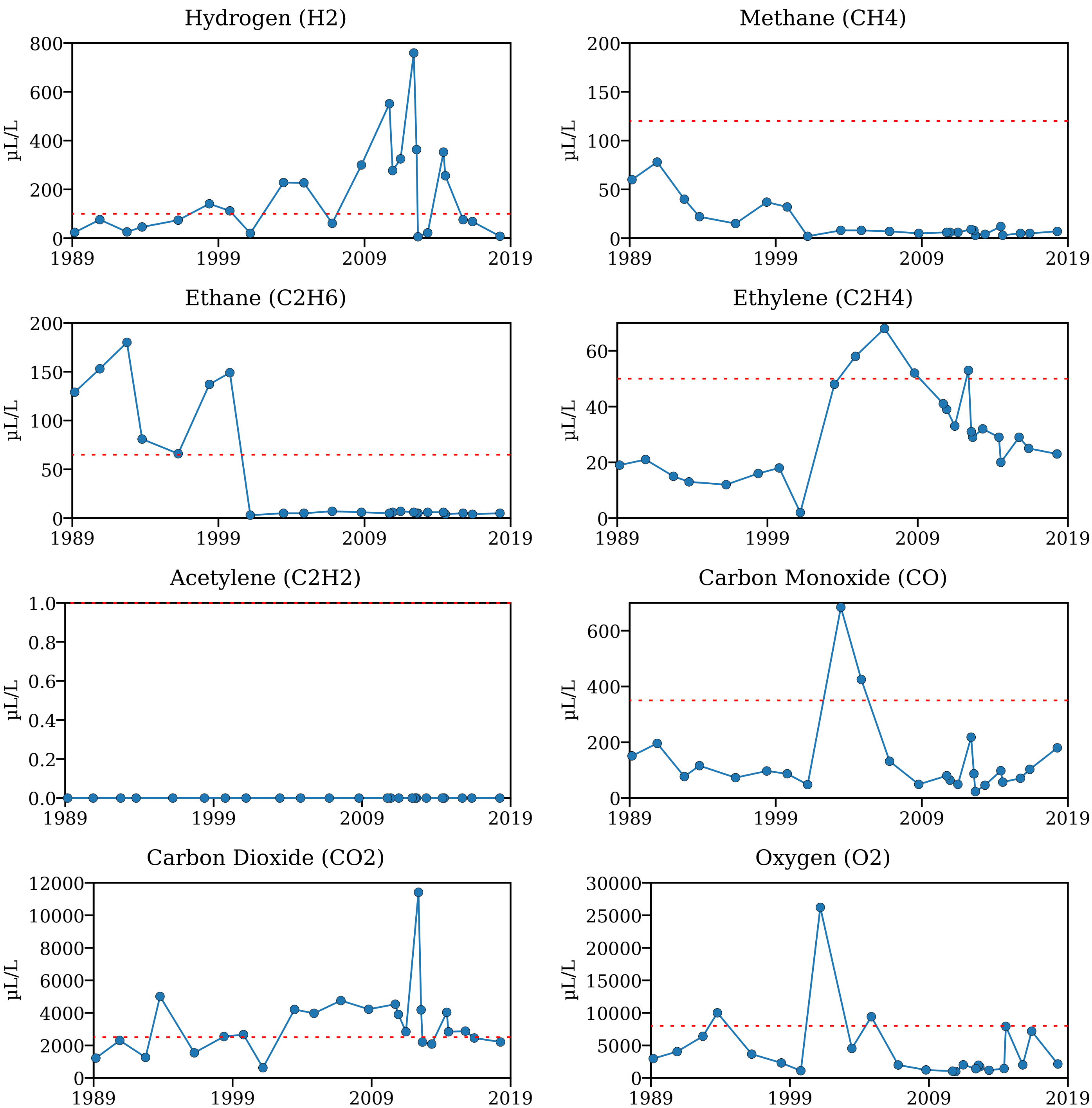
History Graphs and Diagnostic Charts



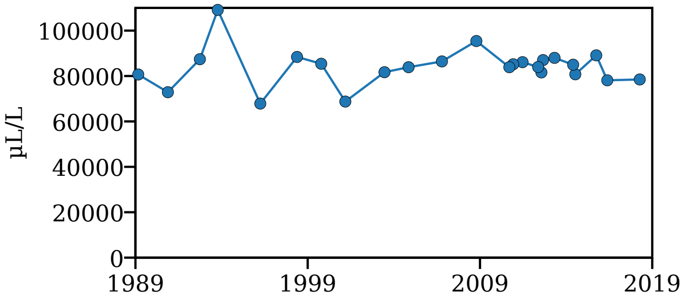




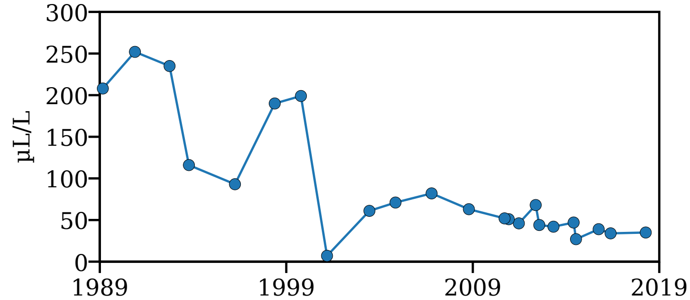



Hydrogen (H2)
µL/L
0
200
400
600
800
1989
1999
2009
2019
Methane (CH4)
µL/L
0
50
100
150
200
1989
1999
2009
2019
Ethane (C2H6)
µL/L
0
50
100
150
200
1989
1999
2009
2019
Ethylene (C2H4)
µL/L
0
20
40
60
1989
1999
2009
2019
Acetylene (C2H2)
µL/L
0.0
0.2
0.4
0.6
0.8
1.0
1989
1999
2009
2019
Carbon Monoxide (CO)
µL/L
0
200
400
600
1989
1999
2009
2019
Carbon Dioxide (CO2)
µL/L
0
2000
4000
6000
8000
10000
12000
1989
1999
2009
2019
Oxygen (O2)
µL/L
0
5000
10000
15000
20000
25000
30000
1989
1999
2009
2019

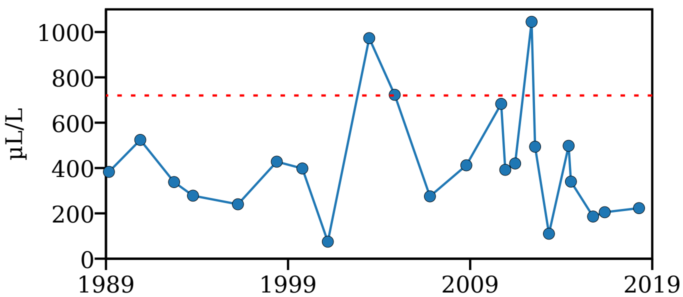
Nitrogen (N2)



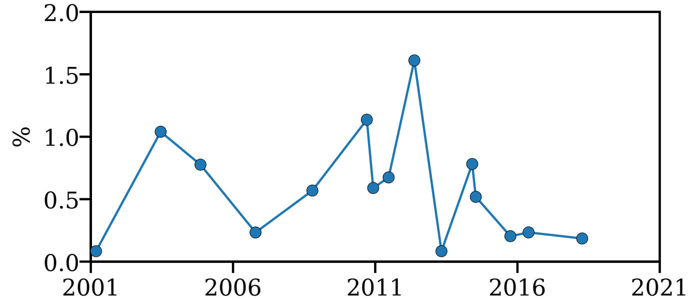
Total heat gas



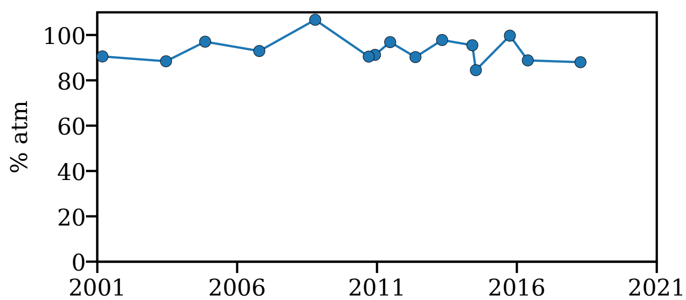
TDCG



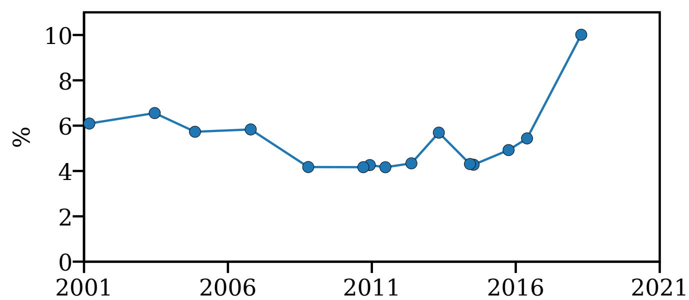
Equivalent TCG



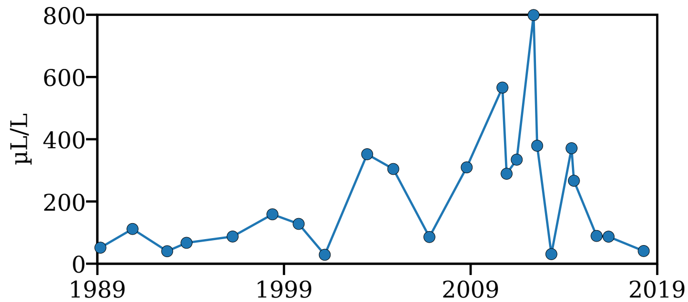
Total partial press



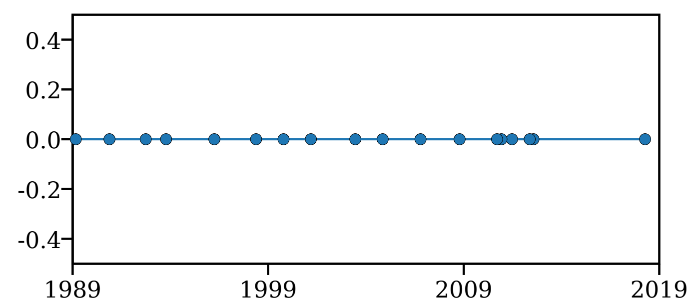
Est. safe handling limit



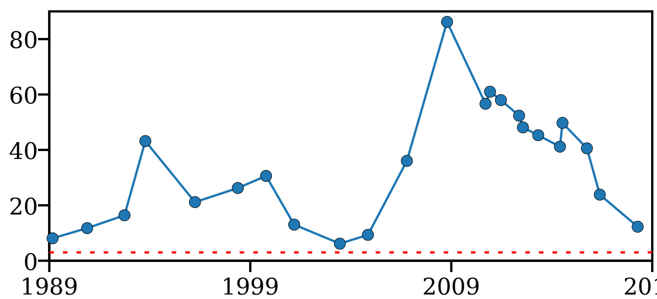
Predicted composite fault gas



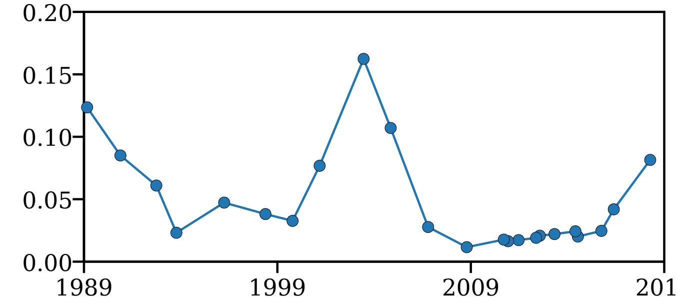
Acetylene/Hydrogen (C2H2/H2)



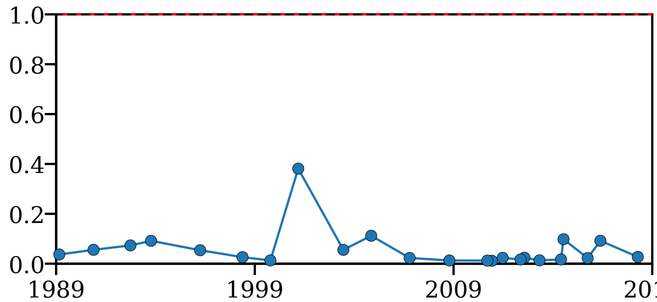
CO2/CO



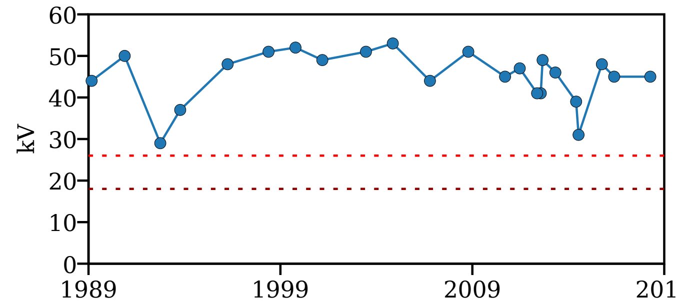
CO/CO2



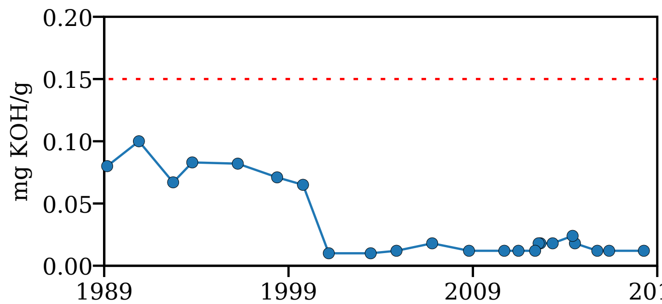
Oxygen/Nitrogen (O2/N2)



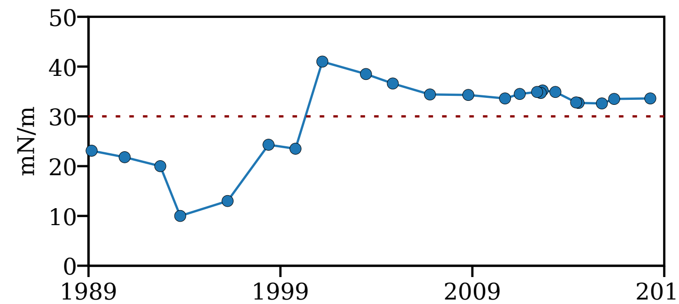
Diel breakdown D877



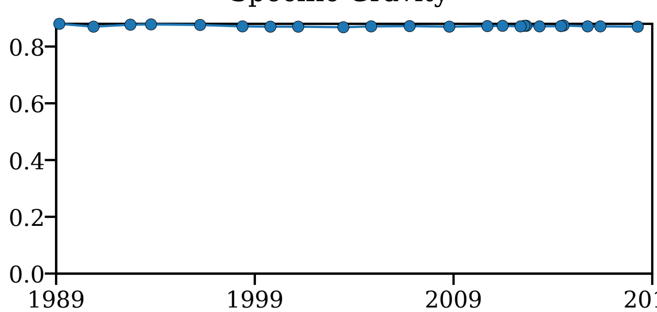
Acid number



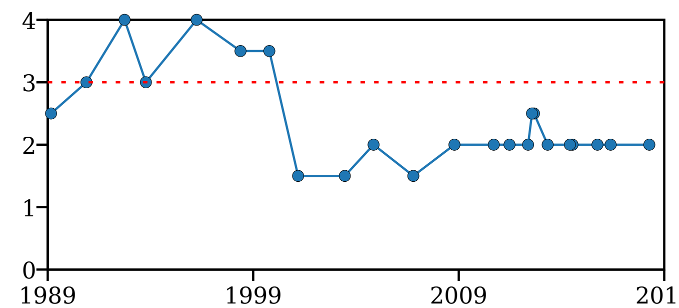
Interfacial tension

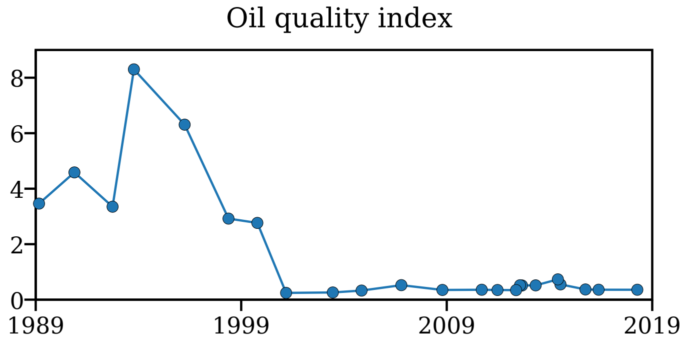


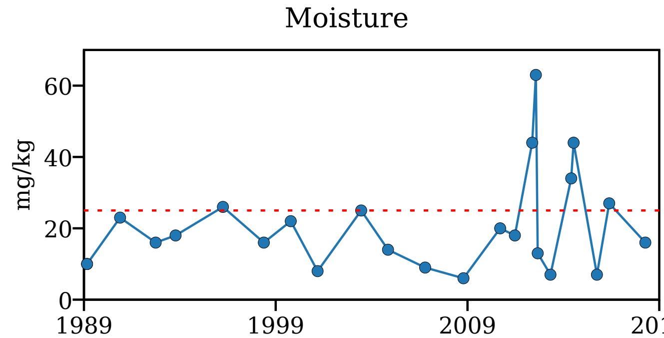
Specific Gravity

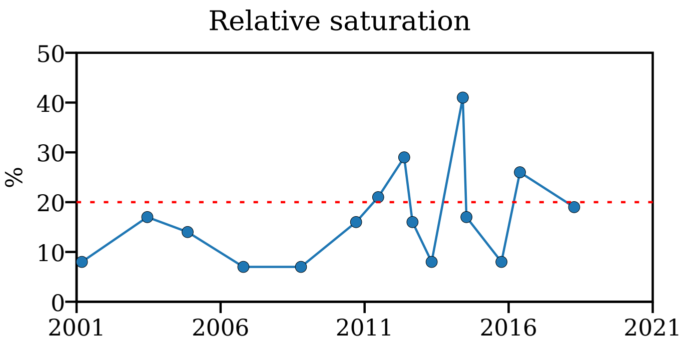


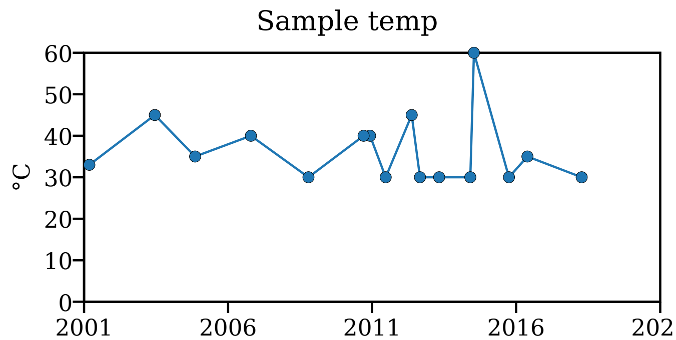
Color




Oil quality index
8
6
4
2
0
1989
1999
2009
2019


Moisture
mg/kg
60
40
20
0
1989
1999
2009
2019


Relative saturation
%
50
40
30
20
10
0
2001
2006
2011
2016
2021


Sample temp
°C
60
50
40
30
20
10
0
2001
2006
2011
2016
2021