BL-101

CHIRON CORPORATION
Internal Memorandum

DATE: March 26, 1993

TO: B. Parry

FROM: L.G. Privari (x3119) / P. S. Wong (x4139)

C.C. J. King, T. Shafique

SUBJECT: Finn-Aqua Clean Steam Generator

We have received a response from Finn Aqua regarding the existing 1500-H-1 Clean Steam generator performance, based on the original test results prior to shipment in April 1988. See attached Telefax message to Peter Simpson from Anne Komppa dated March 23, 1993.

This report indicates that the unit has produced 40% more capacity during the test, than the manufacturers published figures. Allowances were made for reduced capacity over the years, due to stains on the heat exchangers.

The Chiron test results are summarized on the attached table. No conclusions can be drawn from the results, due to trends that are exactly opposite to what it supposed to be. The exact 20 % blow down was not achieved which would have helped. As the clean steam pressure increases the efficiency of the unit supposed to go down. The trend indicates that it was going up, which is unacceptable. Since we can not trust the results, therefore we can not determine the exact capacity the unit would generate.

Suggest to use the manufacturers graph to determine the performance of the unit, and multiply by approx 30% which is just slightly under Finn-Aqua's original test results. The water quality appears to be very good, and not much fouling has built up in the exchanger.
At the revised 7.5 barg plant steam and 3.5 barg clean steam, the graph shows 75% efficiency, which gives 2730*.75*1.3 = 2660 lb/hr total.

Since the total requirement are 2,900 lb/hr, a second smaller unit is recommended to make up for the possible shortcoming. A Finn Aqua 500-S-1 will produce approx 952 lb/hr, or somewhat more with the new machine. The existing 1500-H-1 plus the new 500-S-1 will produce enough to support the current equipment plus another 300 ft sq Lyophilizer.

The 1500-H-1 unit should run at full capacity. Should the demand call for additional capacity, than the 500-S-1 lag unit will come on, as needed.

Please advise if this is acceptable, then I will obtain a quotation for the 500-S-1 unit and the required accessories. A required delivery date would be helpful.

G:\cleanstm

FINN-AQUA SANTASALO-SOHLBERG, CORP.

T E L E F A X M E S S A G E

TO: AMSCO SCIENTIFIC/FINN-AQUA

March 23, 1993

ATTN: Mr. Mr. Peter Simpson
cc. Mr. Bill W. Ruley

Fax: Amsco
No. of pages: 4

FROM: Mrs. Anne Komppa

Tel +358 (0) 258 51
Fax +358 (0) 256 019

Finn-Aqua Santasalo-Sohlberg, Teollisuustie 2,
SF-04300 Tuusula, Finland

RE: Your fax dated March 19.1993/CHIRON tesruns

I reviewed this case with our designers. The conclusion is that there is nothing wrong with this unit especially when compared with the testrunning results.

This unit produced about 40 % more in testrunning than the figures give. Each unit has to produce the amount we have given in figures. Also there is marginal for the unit getting stains in use -which makes the capacity get lower. Each unit is slightly different compared to other units same size. That makes differencies in production when same size of units would be compared to each others in productivity.

Also there are differencies when compared productivity per figure values in 100, 200, 300...5000-S-1 units. 1500-S-1 is very good in production when compared to others.

It is very difficult to say exactly how much a certain unit would produce, but we always promise our unit produces pure steam the amount given in the curve. Closer estimate of the production can be given from the factory, but we never PROMISE it.

Hope this will help you proceeding with this case,
If further questions, please don't hesitate contacting me.

Please see the testrunning protocol enclosed

Best regards,

Anne Komppa

TEST PROTOCOL
KOEAJOPÖYTÄKIRJA 15 / 4 1988

FINN-AQUA pure steam generator
FINN-AQUA puhtaan höyryn kehittäjä

Type No.
Tyyppi 250041

Nominal capacity
Nimellistuotto 250 kg/h

at a pressure
paineella 5 bar

Customer Tilaaja	CETUS / USA		
Serial No. Valmistusnumero	36196/820672		
Test circumstances Koeajao-olosuhteet	Sa - Su Hyvä		
FEED WATER PUMP SYÖTTÖVESIPUMPPU	2,2 kW 460 V 60 Hz I_n 4,1 A	TRANSFORMER MUUNTAJA	0,7 kW 460/24 V
FEED WATER SYÖTTÖVESI			
Raw water quality, from Helsinki mains Raakaveden laatu, lähde vesijohto		Hardness Kovuus	— °dH
Pretreatment softened Esikäsittely ~~pehmennetty~~ Jonivaihdetaan			
Pressure Paine (72)			6,5 bar
Temperature Lämpötila			8 °C

Figures of flow meter (max) Virtausmittarin max. näyttämä (78)	27 l/min 3565 lb/hr ·
Quality Laatu	5 µS/cm
Measured blowdown Mitattu ylivirtaus	249 l/h
PRIMARY STEAM ENSIÖHÖYRY	
Pressure Paine (73)	6 bar
Temperature Lämpötila	– °C
Measured amount of condensate Mitattu lauhteen määrä	3645 1657 kg/h
Pressure of condensate Lauhteen paine (60)	1,0 bar ~~3645 lbhr⁻¹~~
PURE STEAM PUHDAS HÖYRY	
Measured amount Mitattu määrä (9)	1370 kg/h 3014 lb/hr
Pressure on secondary side Toisiopuolen paine (58)	2,2 bar
Quality of condensate from pure steam at maximum capacity Puhtaan höyryn max. kapasiteetin lauhteen laatu	0,5 µS/cm
8902 PYROGEN - V Endotoksin Tislaus Syöttövesi SPR 15.4.88	
Remarks Huomautuksia	

Test protocol made by
Koeajon suoritti [signature] 15 / 4 198 8

Equipment accepted by
Laitteen hyväksyi [signature] 18 / 4 198 8

FINN-AQUA®

SANTASALO-SOHLBERG CORP.

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FINN-AQUA PASSIVATION CERTIFICATE

unit: FINN-AQUA FA 1500H1 ~~water still~~/pure steam generator

serial no. 36196 work no. 20672.

PROCEDURE:

1. All parts manufactured by FINN- AQUA have been passivated with a solution of composition:

   3% HF "hydrofluoric acid" (by volume)

   20% HNO_3 "nitric acid" (by volume)

   77% Deionized water

   Liquid temperature 25..35 degrees Centigrade (77..95 F)

   Treatment time 10..20 minutes

2. Parts were rinsed in deionized water.

   Treatment time 1-2 hours

3. Parts were cleaned with high pressure steam (to remove scale)

accepted by quality dep. Leena Kiekinpolja / QC-Engineer

certification date 18.4.1988

Oy Santasalo-Solberg Ab, Hyrylä, Finland

26-Mar-93

CHIRON CORPORATION

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FINN AQUA Clean Steam Generator testing review

run No	plant steam barg	clean steam barg	percent total from graph	feed water ltr/min	time measured blow dn.	blow dn amount liter	blow dn amount ltr/min	blow dn percent	feed wtr to stm liter	generated clean steam lb/hr	calc clean steam lb/hr	generated percent over actual
1	5	1.5	75	20	6	5	0.83	4.2	19.2	2,534	2,048	124
2	5	1.5	75	22.5	3	4	1.33	5.9	21.2	2,799	2,048	137
3	5	1.5	75	25	3	5	1.67	6.7	23.3	3,085	2,048	151
4	5	1.5	75	28	3	8	2.67	9.5	25.3	3,350	2,048	164
5	5	1.5	75	33	6	33	5.50	16.7	27.5	3,636	2,048	178
6	5	3	35	27	3	20	6.67	24.7	20.3	2,689	956	281
7	5	3	35	25	3	18	6.00	24.0	19.0	2,512	956	263
8	5	3.5	25	21	3	17	5.67	27.0	15.3	2,027	683	297
9	5	3.5	25	19	3	14	4.67	24.6	14.3	1,895	683	278
10	5	3.5	25	17	3	11	3.67	21.6	13.3	1,763	683	258
11	5	3.5	25	15	3	10	3.33	22.2	11.7	1,543	683	226
12	5	4	12	12	3	10	3.33	27.8	8.7	1,146	328	350
13	5	4	12	11.5	3	8	2.67	23.2	8.8	1,168	328	357
14	5	4	12	10	3	7	2.33	23.3	7.7	1,014	328	309

Conclusion :

The generated clean steam over the calculated clean steam percentage was calculated from the test data.
The results do not make any sence, since the efficiency goes up instead of going down with the increased clean steam pressure.
Suggest to ignore the results, and use the manufacturers graph data.