

Monitoring of safety through gas service managed by the gas distribution company

1. Resume

Based on the obligation to register every single gas appliance in Denmark it is possible for the local gas distribution company to manage a service agreement. Furthermore, to monitor the safety of every service customer within the service agreement and to compare to that of natural gas customers without a service agreement. At the same time it is possible for HMN Naturgas I/S (HMN) to monitor the amount and lifetime of spare parts used by each service partner for every single type of boiler being serviced. With around 60,000 service customers, HMN has a lot of data on every type of boiler. Therefore, in case of failure HMN can take action in cooperation with the boiler fabricant or/and assist with safety inspection performed by HMN itself.

2. Surveillance of safety

The surveillance of safety in Denmark, managed by The Danish Safety Technology Authority (SIK), demands local gas distribution companies to perform planned safety inspections of boiler units in operation. The model of surveillance is divided into subgroups typically by year of installation and fabricant. For HMN, the annual

amount of safety inspections in average is 2,400. For a boiler unit within the distribution area of HMN, every boiler has a planned safety inspection for every 109th year or a 20 % chance of a safety inspection during the lifetime of

Fabric/Type	Year	Combustion	With service agreement				Without service agreement			
			Appliance	Checks	Error3	Error4	Appliance	Checks	Error3	Error4
Beretta	1999-2003	Closed	626	34	2,94%	5,88%	1433	74	5,41%	0,00%
Bosch ** 3-16 A	2001-2005	Closed	1162	68	4,41%	0,00%	2943	191	3,14%	0,00%
Forced draught burners	1994-1998	Open	117	14	7,14%	0,00%	641	85	7,06%	4,71%
Forced draught burners	2004-2008	Open	21	3	0,00%	0,00%	160	22	0,00%	0,00%
N.O. TRADING A/S BOX 1G	1989-1993	Open	213	19	10,53%	0,00%	532	30	0,00%	6,67%
N.O. TRADING A/S BOX 1G	1994-1998	Open	9	7	0,00%	0,00%	19	12	8,33%	0,00%
HS Tarm (Baxi) PF 50 el. PF3	1999-2003	Closed	714	50	6,00%	0,00%	1482	100	3,00%	4,00%
HS Tarm Apollo 50B and 65B	1984-1988	Closed	109	15	0,00%	0,00%	191	48	4,17%	0,00%
HS Tarm B.G. Vent and Baxi Premix.	1996-2000	Closed	347	32	0,00%	12,50%	659	65	4,62%	6,15%
HS Tarm and Baxi Wall mounted	2004-2008	Closed	184	23	4,35%	0,00%	553	46	2,17%	0,00%
HS Tarm and Baxi Others	1999-2003	Closed	272	22	4,55%	9,09%	844	74	1,35%	0,00%
Junkers/Bosch	1984-1988	Closed	522	34	5,88%	0,00%	799	56	3,57%	3,57%
Junkers/Bosch 11 kW	1994-1998	Closed	1024	45	0,00%	0,00%	2735	114	0,00%	0,88%
Junkers/Bosch 11 kW	1999-2003	Closed	560	22	4,55%	0,00%	1903	122	1,64%	0,00%
Junkers/Bosch 18 kw	1994-1998	Closed	1422	72	5,56%	0,00%	2828	171	1,75%	1,17%
Junkers/Bosch Others	1994-1998	Closed	663	54	0,00%	1,85%	1307	102	3,92%	1,96%
Junkers/Bosch Others	1999-2003	Closed	612	39	7,69%	0,00%	1750	97	0,00%	0,00%
Calorifere	1995-1999	Open	5	1	0,00%	0,00%	184	24	8,33%	0,00%
Condensing (Not nefit or kiddy)	1986-1990	Closed	26	7	0,00%	0,00%	89	13	15,38%	0,00%
Saunier Duval	1999-2003	Closed	431	22	4,55%	0,00%	2294	148	7,43%	0,00%
Units all	-1983	Open	92	13	7,69%	0,00%	239	33	15,15%	3,03%
Units all	1994-1998	Open	186	23	0,00%	0,00%	347	36	5,56%	0,00%
Units only Tasso	1984-1988	Open	225	31	3,23%	0,00%	469	56	0,00%	8,93%
Vaillant 126/C & 126/2-C	2001-2005	Closed	1395	51	0,00%	3,92%	3798	129	4,65%	0,00%
Vaillant 136-E & 136/2E	2001-2005	Closed	1266	53	1,89%	0,00%	3302	147	3,40%	2,72%
Vaillant not 112, 185	1994-1998	Closed	1323	95	5,26%	1,05%	2859	191	5,76%	2,62%
Vaillant VC 112	1994-1998	Closed	746	44	0,00%	4,55%	1794	92	8,70%	4,35%
Vaillant wall mounted	2004-2008	Closed	462	20	5,00%	5,00%	2205	130	0,00%	0,77%
Vaillant others	2001-2005	Closed	772	41	2,44%	0,00%	2114	121	4,13%	1,65%
Wall mounted	1994-1998	Open	180	15	0,00%	0,00%	471	45	2,22%	22,22%
Wall mounted	1999-2003	Open	18	13	0,00%	0,00%	57	46	6,52%	0,00%
Others boilers	1994-1998	Closed	643	40	0,00%	0,00%	1434	89	4,49%	0,00%
Others boilers	1999-2003	Closed	129	20	0,00%	0,00%	412	45	0,00%	4,44%
			16476	1042	3,17%	1,44%	42847	2754	3,74%	2,00%

Figure 1 - Performed safety inspections by HMN in 2011 and 2012

the boiler. Every 5th year the subgroups are reinspected, but for different units to compare the level of safety during these five years. If the number of failure is increasing or a severe safety hazard has been observed during the safety inspections, the local gas distribution companies, in cooperation with SIK, informs other customers using a similar type of boiler unit about the observation and a suggested solution to the observation. In general, the safety inspections show that older units with open combustion typically have the biggest issues. For these units, it is generally found that either the law demanded service has not been performed, or notification about a replacement is missing. During safety inspections performed by HMN in 2011 and 2012, figure 1 shows what was recorded.

The chart is divided into appliance and inspections with and without a service agreement through HMN. Error3 is a failure for which a second failure can course a high risk for the owner/user. Error4 is a failure for which there is a high risk for the owner/user.

The safety inspections in 2011 and 2012 covered a total of 59,323 appliances with 3,796 safety inspections. In general, the safety level with or without a service agreement though HMN is similar (figure 2).

Failure with confidence interval of 95 %				
	With service		Without service	
	Error3	Error4	Error3	Error4
Low	0,19%	0,00%	0,00%	0,00%
High	6,14%	4,84%	7,68%	6,21%

Figure 2 - Error level in 2011 and 2012

3. High service level provides higher customer satisfaction

The service agreement provided by HMN is based on cooperation between HMN and a local service partner. HMN is responsible for the most of the administration, while the local service partner carry out the physical work for the single customer. In solidarity, new customers are recruited by HMN and the service partners to the service agreement. In general, the aim for HMN is to present

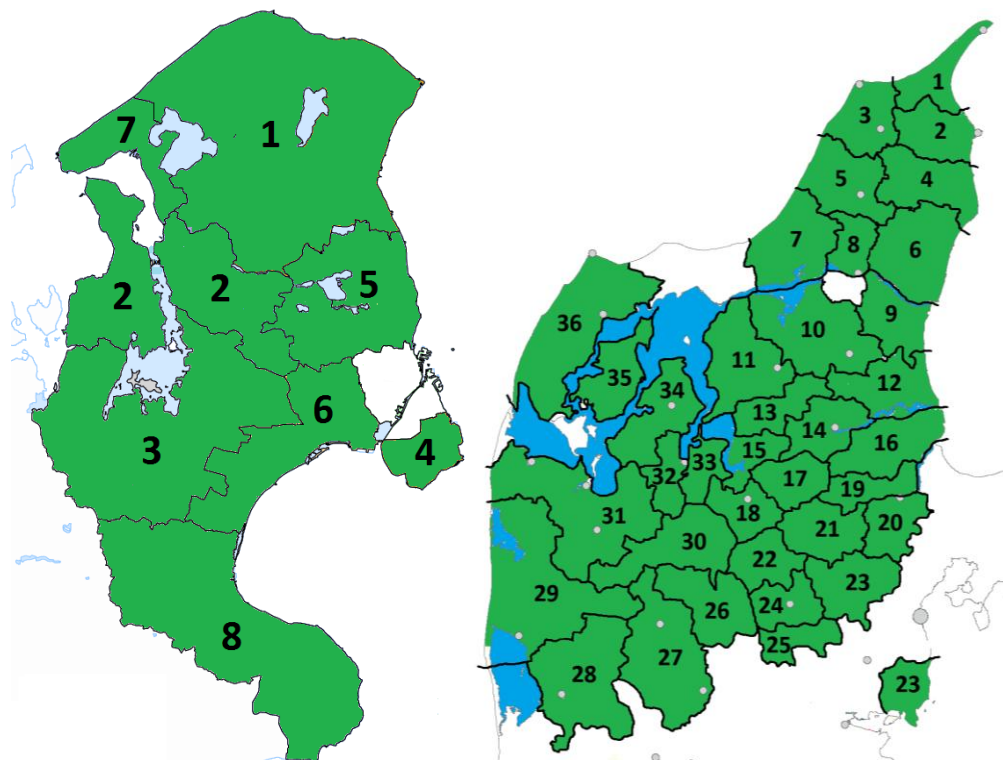


Figure 3 - Service areas of Zealand and Jutland

at least two local service partners on all brands in every area. This is a challenge in low populated areas or if

the customer has a rare unit. The distribution area for HMN is in Jutland divided into 36 smaller service areas, while for Zealand into 8 areas, as shown on the two maps in figure 3.

	Baxi	Bosch	Geminiox	HS-Tarm	Vaillant	Viessmann	Weishaupt
Area 01	6	7	4	6	7	6	5
Area 02	6	6	4	6	6	5	5
Area 03	5	5	3	5	5	4	4
Area 04	8	8	4	8	8	6	7
Area 05	7	7	3	7	7	5	6
Area 06	8	8	4	8	8	6	7
Area 07	7	7	3	7	7	5	6
Area 08	7	7	3	7	7	5	6
Area 09	9	9	4	9	9	6	8
Area 10	8	8	6	8	8	6	7
Area 11	8	8	7	8	8	7	7
Area 12	9	9	7	9	9	8	7
Area 13	8	8	7	8	8	7	7
Area 14	11	12	9	10	12	11	9
Area 15	15	14	11	15	15	13	13
Area 16	10	11	7	9	11	10	7
Area 17	18	18	13	17	19	16	15
Area 18	18	17	15	18	19	16	15
Area 19	11	12	9	10	12	11	9
Area 20	11	11	9	10	12	10	8
Area 21	14	14	10	14	16	12	10
Area 22	15	16	9	17	18	12	14
Area 23	12	12	7	12	14	10	10
Area 24	14	15	7	14	15	11	12
Area 25	14	14	7	14	14	11	12
Area 26	13	14	8	13	14	10	12
Area 27	8	8	6	8	8	7	6
Area 28	6	6	5	6	6	5	5
Area 29	5	5	4	5	5	4	4
Area 30	12	11	10	13	13	10	10
Area 31	8	8	6	8	8	7	5
Area 32	13	13	13	14	14	11	10
Area 33	13	13	12	14	14	11	11
Area 34	8	8	7	8	8	7	5
Area 35	7	7	6	8	8	5	5
Area 36	5	5	4	6	7	4	4

Figure 5 - Area coverage of Jutland

is thereby not forced to take a customer, and can always hand the customer to another service partner. In general, for all natural gas users in the area of HMN, customers with a service agreement through HMN are more satisfied than those without a service agreement. Therefore, the service agreement supports the vision of HMN of being the company for the customers and of delivery of the most complete customer service to every single customer.

4. Monitoring of spare part use and prices

A major part of maintaining the high service level that HMN offers though the service agreement is that the customers pay their respective service costs on their gas bill issued by HMN. Therefore, the yearly cost for the service agreement is divided into smaller accounts, where used spare parts are charged for on the first coming gas bill issued by HMN. It gives the service partner a security for the expenses because this deal is

	Baxi	Bosch	Geminiox	HS-Tarm	Vaillant	Viessman	Weishaupt
Area 01	12	12	7	12	12	8	12
Area 02	10	10	6	11	10	6	10
Area 03	11	11	6	11	11	8	11
Area 04	10	11	8	10	10	6	11
Area 05	13	13	8	13	13	8	13
Area 06	12	13	8	12	12	8	13
Area 07	6	5	3	6	6	5	6
Area 08	10	12	6	11	11	8	11

Figure 4 - Area coverage of Zealand

The brands of Bosch, Vaillant, HS-Tarm, Baxi, Geminiox, Viessmann and Weishaupt cover about 90 % of all the service customers in the service agreement of HMN. Figure 4 and 5 show that when considering brand, 90 % of the customers within the service agreement have at least three different service partners to choose from. For the customer it is very important to have the opportunity to choose between local service partners in case of disagreements/discrepancies in between the parties involved. In such a case, it is possible to move the customer to another local service partner, and still keep the customer within the HMN service agreement. In addition, it is convenient for a service partner that it can call for a second opinion performed by another service partner. The current service partner

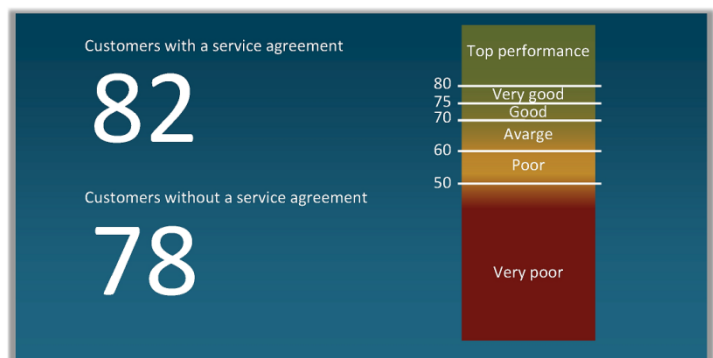


Figure 6 - Over all customer survey of HMN

between the service partner and HMN. HMN is paying the service partners once a month for every service and spare part used in the previous month. Through this routine, the service partners have to report to HMN the use of spare parts and the price for each service inspection carried out for the customers. This allow for HMN to keep track of the spare parts used by each service partner along with service prices. Thus, it becomes evident if any service partner is delivering a generally more expensive service than another service partners do on the exact same product. This recording is not only for the planned service, but also for urgent calls. Therefore, this also makes it possible to evaluate whether a service partner uses a lot of spare parts during planned service and compare to the frequency of urgent calls. For example, a case of low spare part use at the planned service, but a very high frequency of urgent calls. Figure 6 shows the use of spare parts in 2013 for every service partner in HMN for a specific boiler.

Service partner ID	Planned service			Urgent calls							Total	
	Price / service	Spare part use / service	Preformed service	Customers	Urgent calls	Urgent calls/customer	Spare part use / Customer	Price / urgent call	Price / urgent call / customer	Spare part use / urgent call / customer	Price	Spare part use
19	-	-	1	5	0	0,00%	0,00	-	-	0,00	-	-
23	-	-	1	4	0	0,00%	0,00	-	-	0,00	-	-
24	-	-	2	2	0	0,00%	0,00	-	-	0,00	-	-
32	-	-	2	6	0	0,00%	0,00	-	-	0,00	-	-
39	-	-	1	2	1	50,00%	0,00	-	-	0,00	-	-
25	-	-	6	16	1	6,25%	1,00	2.603,22	162,70	0,06	162,70	0,06
15	50,96	0,18	57	134	7	5,22%	0,86	964,45	50,38	0,04	101,35	0,22
37	-	-	2	4	1	25,00%	1,00	2.603,22	650,81	0,25	650,81	0,25
27	27,00	0,33	3	8	0	0,00%	0,00	-	-	0,00	27,00	0,33
8	70,49	0,21	24	68	10	14,71%	0,90	1.428,64	210,09	0,13	280,58	0,34
28	317,91	0,40	5	7	0	0,00%	0,00	-	-	0,00	317,91	0,40
29	200,00	0,50	2	2	0	0,00%	0,00	-	-	0,00	200,00	0,50
30	-	-	6	14	6	42,86%	1,17	1.743,85	747,36	0,50	747,36	0,50
6	216,44	0,44	16	55	3	5,45%	1,33	632,76	34,51	0,07	250,95	0,51
21	253,68	0,36	11	20	4	20,00%	1,50	394,75	78,95	0,30	332,63	0,66
31	47,47	0,67	6	21	0	0,00%	0,00	-	-	0,00	47,47	0,67
40	245,64	0,75	4	8	0	0,00%	0,00	-	-	0,00	245,64	0,75
33	246,36	0,74	66	148	24	16,22%	0,42	454,36	73,68	0,07	320,04	0,81
16	60,19	0,67	23	30	11	36,67%	0,55	820,85	300,98	0,20	361,17	0,87
42	1.073,25	0,88	17	52	1	1,92%	2,00	1.841,37	35,41	0,04	1.108,66	0,92
26	454,31	0,75	8	17	3	17,65%	1,00	1.921,33	339,06	0,18	793,37	0,93
22	182,38	1,00	4	10	0	0,00%	0,00	-	-	0,00	182,38	1,00
36	521,54	1,00	2	7	0	0,00%	0,00	-	-	0,00	521,54	1,00
44	424,10	1,00	2	6	0	0,00%	0,00	-	-	0,00	424,10	1,00
43	615,58	1,13	8	17	0	0,00%	0,00	-	-	0,00	615,58	1,13
2	450,16	1,00	38	95	13	13,68%	1,54	1.162,75	159,11	0,21	609,28	1,21
18	336,56	1,00	6	10	2	20,00%	1,50	521,88	104,38	0,30	440,93	1,30
38	433,70	1,21	19	41	2	4,88%	2,00	618,08	30,15	0,10	463,85	1,31
41	565,26	1,33	3	9	1	11,11%	1,00	2.681,91	297,99	0,11	863,25	1,44
12	329,15	1,26	23	54	11	20,37%	1,82	906,00	184,56	0,37	513,70	1,63
35	315,56	1,35	55	149	20	13,42%	2,20	1.189,87	159,71	0,30	475,27	1,64
34	351,45	1,67	3	13	0	0,00%	0,00	-	-	0,00	351,45	1,67
5	594,64	1,67	45	191	14	7,33%	0,86	552,93	40,53	0,06	635,17	1,73
20	233,54	1,60	5	15	2	13,33%	2,00	1.798,21	239,76	0,27	473,30	1,87
7	792,39	2,10	29	76	8	10,53%	0,88	643,30	67,72	0,09	860,10	2,20
9	1.087,68	2,11	248	640	55	8,59%	1,15	1.087,42	93,45	0,10	1.181,13	2,21
13	699,97	2,10	10	20	2	10,00%	1,50	1.520,94	152,09	0,15	852,06	2,25
10	733,82	2,19	57	210	18	8,57%	1,33	852,66	73,09	0,11	806,90	2,31
3	923,93	2,17	363	943	95	10,07%	1,65	1.117,19	112,55	0,17	1.036,47	2,33
17	653,66	2,50	2	2	0	0,00%	0,00	-	-	0,00	653,66	2,50
11	714,66	2,43	21	48	6	12,50%	1,17	1.083,63	135,45	0,15	850,11	2,57
1	865,03	2,55	40	84	12	14,29%	1,33	1.317,11	188,16	0,19	1.053,19	2,74
4	747,22	2,71	76	214	17	7,94%	0,65	570,61	45,33	0,05	792,54	2,76
14	1.143,04	3,53	19	42	8	19,05%	0,75	425,86	81,12	0,14	1.224,15	3,67
Total	728,26	1,80	1.379	3519	358	10,17%	1,28	999,42	101,67	0,13	829,94	1,93

Figure 7 - Service cost and spare part use for a specific boiler in 2013

Each row in the chart represents a service partner, who has a customer with the specific type of boiler.

- **Price / service** is the average price for spare parts used at planned service

- **Spare part use / service** is the average spare parts used at planned service
- **Performed service** is the total number of performed planned service in 2013
- **Customers** is the total number of customers with this type of boiler
- **Urgent calls** is the total number of urgent calls in 2013 made by customers with this type of boiler
- **Urgent calls / customer** is the average amount of urgent calls per customer in 2013 made by customers with this type of boiler
- **Spare part use / customer** is the average use of spare parts for an urgent call for customers with this type of boiler
- **Price / urgent call** is the average price for spare parts used for an urgent call for customers with this type of boiler
- **Price / urgent call / customer** is the average price for urgent calls multiplied with the frequency of urgent calls. It gives the estimated expenses for every customer for urgent calls per year
- **Spare part use / urgent call / customer** is the average spare part use for an urgent call multiplied with the frequency of urgent calls. It gives the estimated use of spare parts for every customer per year
- **Price** is the annual total service price for planned service and savings for urgent calls
- **Spare part use** is the annual total use of spare parts during planned service and urgent calls

Figure 7 shows that the service partner with number 32 in 2013 could perform two planned services and take care of six customers in total without the use of spare parts. In the bottom of figure 7, service partner with number 14 performed 19 planned services and took care of 42 customers with an average price of 1,224 DKR and an average use of 3.67 spare parts per customer. The bottom row, Total, are the average numbers for all service partners on this type of boiler. The normal procedure for HMN is, for this case, to contact service partner no. 14 and present to this service partner the numbers of a high use of spare parts at planned services and a high frequency of urgent calls. Together we will find a solution so the service partner can reduce his frequency of urgent calls and also lower his use of spare parts at planned services. This procedure is to have the customer in the centre to perform and deliver the best service for each customer. One solution could be not to replace electrodes for spark and flame detection at every planned service, since many electrodes are changed too often. In most cases, the electrodes could easily last at least one more service period. This will all be a part of the material, which HMN will present for the service partner to locate where this specific service partner is deviating from other service partners, who can deliver a cheaper and more effective service.

Figure 8 shows:

- **Planned service** is the total number of performed services in 2013
- **Urgent calls** is the total number of urgent calls in 2013
- **Electrode PS** is the total use of electrodes for planned services
- **Electrode UC** is the total use of electrodes for urgent calls
- **Frequency PS** is the average use of electrodes for planned services
- **Electrode UC** is the average use of electrodes for urgent calls

The figure 8 shows that service partner number 14, who was the most expensive, is changing electrodes almost every time. The three last service partners are using 77 % of all electrodes on this specific boiler and they perform 45 % of the planned services. In this case, HMN would take action and inform all three service partners about what looks like over use of spare parts without any effect for the single customer. On average, the use of natural gas and boiler set up is equal for every customer between the service partners. A special installation could result in use of electrodes at every planned service, but the likelihood that one service partner has 90 % of special installations compared to another service partner is close to zero.

Figure 9 shows:

- **Year** is the year of installation
- **PS-Price** is the average price for a planned service
- **SPU PS** is the average use of spare parts during planned services
- **PS** is the total number of performed planned services

For year 2002 and 2003 figure 9 shows that the price and use of spare parts is increasing compared to newer boilers. A similar trend is seen for 2006 and 2007. It indicates that this type of boiler implies a higher use of spare parts when it is about 7-8 years old and again 10-11 years old. When every service partner has to report to HMN the use of spare parts, it is possible to see what spare parts have been used for a

Specific boiler						2013	
Service partner ID	Planned service	Urgent calls	Electrode PS	Electrodes UC	Frequency PS	Frequency UC	
16	23	11	0	0	0,0%	0,0%	
18	6	2	0	0	0,0%	0,0%	
19	1	0	0	0	0,0%	0,0%	
20	5	2	0	0	0,0%	0,0%	
22	4	0	0	0	0,0%	0,0%	
23	1	0	0	0	0,0%	0,0%	
24	2	0	0	0	0,0%	0,0%	
25	6	1	0	0	0,0%	0,0%	
27	3	0	0	0	0,0%	0,0%	
29	2	0	0	0	0,0%	0,0%	
30	6	6	0	0	0,0%	0,0%	
31	6	0	0	0	0,0%	0,0%	
32	2	0	0	0	0,0%	0,0%	
37	2	1	0	0	0,0%	0,0%	
38	19	2	0	0	0,0%	0,0%	
39	1	1	0	0	0,0%	0,0%	
40	4	0	0	0	0,0%	0,0%	
41	3	1	0	0	0,0%	0,0%	
12	23	11	0	1	0,0%	9,1%	
15	57	7	1	0	1,8%	0,0%	
35	55	20	2	0	3,6%	0,0%	
8	24	10	1	0	4,2%	0,0%	
42	17	1	2	0	11,8%	0,0%	
6	16	3	2	0	12,5%	0,0%	
2	38	13	5	1	13,2%	7,7%	
33	66	24	9	1	13,6%	4,2%	
5	45	14	7	1	15,6%	7,1%	
21	11	4	2	0	18,2%	0,0%	
11	21	6	4	0	19,0%	0,0%	
26	8	3	2	0	25,0%	0,0%	
13	10	2	3	0	30,0%	0,0%	
34	3	0	1	0	33,3%	0,0%	
10	57	18	19	2	33,3%	11,1%	
7	29	8	10	1	34,5%	12,5%	
1	40	12	16	0	40,0%	0,0%	
28	5	0	2	0	40,0%	0,0%	
4	76	17	34	0	44,7%	0,0%	
17	2	0	1	0	50,0%	0,0%	
36	2	0	1	0	50,0%	0,0%	
43	8	0	4	0	50,0%	0,0%	
44	2	0	1	0	50,0%	0,0%	
9	248	55	172	5	69,4%	9,1%	
3	363	95	256	4	70,5%	4,2%	
14	19	8	14	0	73,7%	0,0%	
Total	1.379	358	571	16	41,4%	4,5%	

Figure 8 - Use of electrodes on a specific boiler in 2013

Specific boiler		2013	
Year	PS-Price	SPU PS	PS
2002	922,16	1,97	36
2003	804,60	1,83	110
2004	677,40	1,67	169
2005	667,77	1,77	248
2006	747,55	1,84	253
2007	772,17	1,86	440
2008	613,60	1,65	81
2009	585,36	1,74	38
2010	267,89	0,50	2
2012	80,00	1,00	1
2013	1.036,72	3,00	1
Total	728,26	1,80	1.379

Figure 9 - Price and spare use by year

specific year and group compared to others and look for trends. HMN can pass on this information to the relevant producer. Thereby, the producer can take action and maybe optimise a specific part to ensure that the product does not get a reputation of being an expensive boiler. Also, to ensure that the single customer gets the best and cheapest service.

Figure 10 shows a comparison of the service partners with number 3, 5 and 9:

Specific boiler	2013								
	Service partner 3			Service partner 5			Service partner 9		
Year	PS-Price	SPU PS	PS	PS-Price	SPU PS	PS	PS-Price	SPU PS	PS
2002	1.201,22	2,50	10	-	-	1	1.106,58	2,07	14
2003	1.062,19	2,46	28	687,08	2,00	2	1.137,80	2,40	15
2004	923,04	2,26	39	1.189,70	2,50	2	842,42	1,70	40
2005	836,98	2,05	61	1.338,04	2,57	7	939,36	2,08	38
2006	968,97	2,21	84	514,42	1,38	13	1.059,90	2,14	43
2007	884,72	2,05	130	339,65	1,44	9	1.290,05	2,25	84
2008	871,99	2,50	8	190,76	1,33	6	1.101,31	2,33	9
2009	1.064,66	2,67	3	550,02	1,80	5	788,16	2,00	5
Total	923,93	2,17	363	594,64	1,67	45	1.087,68	2,11	248

Figure 10 - Service price and spare use for three service partners by year

In this case, the use of spare parts by service partner no. 9 is increasing from 2003 and 2006-2008. Service partner no. 5 experiences an increase from 2004 and 2005. Whereas, service partner no. 3 has a generally higher use of spare parts.

Figure 11 shows the use of

spare parts for service partner no. 3 for boilers from 2002 and 2003 compared to boilers from 2005:

Figure 11 shows that the change of burner and expansion tank is increasing for the boiler from 2002/2003 compared to the boiler from 2005. The use remains low and it is mainly electrodes and burner gaskets, which are changed during planned service. For all service partners, who is servicing this type of boiler, there were changed 35 burners all in all, which is showed in figure 12.

Figure 12 shows that after a period of 6 years, the first burners are changed during planned services. It can be due to low quality burner nets etc. After a period of 6

Specific boiler	2013		
	Year	Number	PS
Burner change			Frequency
2002	2	36	5,56%
2003	4	110	3,64%
2004	6	169	3,55%
2005	5	248	2,02%
2006	6	253	2,37%
2007	12	440	2,73%
2008	0	81	0,00%
2009	0	38	0,00%
2010	0	2	0,00%
2012	0	1	0,00%
2013	0	1	0,00%

Figure 12 - Burner use in 2013 by year

years, the change of burners is increasing slowly. Once again this is information HMN can hand over to the producer. Thus, the service agreement in HMN provides a larger data basis than any other service provider.

Service partner 3		
Specific boiler	Year 2002 and 2003	
	Number	Frequency
Burner	2	5%
Electrodes	25	66%
Burner gasket	17	45%
Valve	1	3%
Nitrogen	14	37%
Air escape	4	11%
Membrane	2	5%
Gasket, flue gas system	25	66%
Cleaning set	1	3%
Safety valve	1	3%
Expansion tank	2	5%
Specification	Year 2005	
	Number	Frequency
Burner	1	2%
Electrodes	41	67%
Burner gasket	22	36%
Valve	2	3%
Nitrogen	21	35%
Gasket, 3/4"	1	2%
Gasket, electrodes	1	2%
Gasket, flue gas system	27	44%
Cleaning set	1	2%
Safety valve	1	2%
Time rate	1	2%
Air escape	5	8%
Flue gas pipe, 1 m	1	2%

Figure 11 - Spare part use at planned service for service partner no. 3