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MICROWAVE MELT AND OFFGAS ANALYSIS RESULTS FROM A FERRO CORPORATION® GLASS FRIT

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TABLE OF CONTENTS

ABSTRACT	3
INTRODUCTION	4
EXPERIMENTAL PROCEDURE	4
RESULTS AND DISCUSSION	6
CONCLUSIONS	11
RECOMMENDATIONS	12
REFERENCES	13
APPENDIX A PHOTOGRAPHS 1-8	A-1
APPENDIX B 3-D DYNAMIC OFFGAS PROFILE CHARTS 1-12	B-1
APPENDIX C RESULT TABLES 1-12	C-1
APPENDIX D TDMS RAW DATA SETS 1-12	D-1

ABSTRACT

In support of the Residue Treatment Technology (RTT) Microwave Solidification project, Waste Projects and Surface Water personnel conducted a series of experiments to determine the feasibility of encapsulating a surrogate sludge waste using the microwave melter. The surrogate waste was prepared by RTT and melted with five varying compositions of low melting glass frit supplied by the Ferro Corporation®. Samples were melted using a 50% waste/50% glass frit and a 47.5% waste/47.5% glass frit/5% carbon powder. This was done to evaluate the effectiveness of carbon at reducing a sulfate-based surface scale which has been observed in previous experiments and in full-scale testing. These vitrified samples were subsequently submitted to Environmental Technology for toxicity characteristic leaching procedure (TCLP) testing.

Two of the five frits tested in this experiment merit further evaluation as raw materials for the microwave melter. Ferro frit 3110 with and without carbon powder produced a crystalline product which passed TCLP testing. The quality of the melt product could be improved by increasing the melting temperature from 900°C to approximately 1150-1200°C. Ferro frit 3249 produced the optimal quality of glass based on visual observations, but failed TCLP testing for silver when melted without carbon powder. This frit requires a slightly higher melting temperature ($\geq 1200^{\circ}\text{C}$) compared to frit 3110 and produces a superior product.

In conjunction with this work, Surface Water personnel conducted offgas analyses using a Thermal Desorption Mass Spectrometer (TDMS) on selected formulations. The offgas analyses identified and quantified water vapor (H_2O), oxygen (O_2) and carbon oxides (CO and CO_2), sulfur (S) and sulfur oxides (SO and SO_2), and nitrogen (N_2) and nitrogen oxides (NO and NO_2) that volatilized during glass formation.

INTRODUCTION

Microwave heating and melting are relatively new advancements in ceramic processing which utilize microwave radiation to heat ceramic products to adequate temperatures for sintering or melting. An advantage to this technique is that it enables more rapid heating than traditional heating mechanisms. This decrease in cycle time may help limit exposure to workers encapsulating radioactive and/or toxic waste.

As part of the microwave solidification development at EG&G Rocky Flats, Residue Treatment Technology (RTT) personnel prepared a surrogate sludge waste based on characterization information of actual waste. This waste was spiked with various Resource Conservation and Recovery Act (RCRA) listed metals including chromium, cadmium, nickel, lead, and silver. A series of melting experiments were conducted to determine the feasibility of processing this waste in the microwave melter. All melting experiments were conducted at a soak temperature approximately 150-175°C above the fusion temperature for each frit provided by Ferro Corporation. These frits have an advantage over other raw material sources (i.e., borax and diatomaceous earth) in that they can usually be processed at lower temperatures. This is because the powders consist of tiny glass particles which have already been melted and ground to a fine particle size. These characteristics make these frits easier to re-melt into a glass product. One disadvantage of these frits, however, is that utilizing them increases the raw material costs.

The melting temperatures for the Ferro glass frits ranged from 900°C to 1200°C, depending on the frit composition (Table 1), with a soak time of 1 hour. The sample weight was measured prior to and after the melt run for determination of loss on ignition (LOI). The LOI data gives an indication of weight loss due to volatile gases disassociating from the powder, and can be compared against offgas analysis for identification. For this reason, RTT also requested on-line Thermal Desorption Mass Spectrometer (TDMS) measurement of the powder formulations to identify constituents volatilized during glass formation.

Table 1: Ferro Glass Frit Composition

Frit No.	3110	3225	3249	3270	3292
Fusion Temp. (°C)	746	885	1024	801	885
Melt Temp. (°C)	900	1050	1200	975	1050
Oxide	Wt. %				
SiO ₂	69.8	65.0	42.1	51.4	61.1
K ₂ O	2.3			5.5	3.1
Na ₂ O	15.3	4.4		8.6	3.0
Li ₂ O					0.4
Al ₂ O ₃	3.7	8.2	13.3	8.6	10.7
B ₂ O ₃	2.6	21.9	28.9	16.5	5.7
SrO					4.8
MgO		0.2	12.2		0.7
CaO	6.3	0.3	3.5	9.4	10.5
Total	100.0	100.0	100.0	100.0	100.0

EXPERIMENTAL PROCEDURE

Glass Formation

RTT prepared the surrogate sludge waste based on waste characterization information and shipped this material along with samples of the five Ferro glass frits to Building 881 for testing. For each melt experiment, 100 grams of powder (frit plus waste plus carbon) were required. These powders were weighed in a Coors® 998 Al₂O₃ crucible (99.8% purity) and mixed using a metal spatula to improve the homogeneity of the powder mixture. For this experiment, a total of ten melt runs were conducted per RTT. Two additional melting trials were conducted at significantly higher temperatures (approximately 400-600°C higher than the listed fusion temperature). This was the result of an error in assuming that Ferro Corporation's data was reported in degrees Celsius.

For each run, the weight of the empty crucible was measured and recorded to allow LOI calculations on the final product. Powder quantities were weighed and placed in the crucible, and the crucible was loaded into a Deltech® furnace. The furnace was ramped from ambient room temperature to the soak temperature at 500°/hr. The soak temperature was approximately 150-175°C above the frit fusion temperature as provided by Ferro. The soak time at 1200°C was 1 hour for each of the ten runs. The furnace was then cooled at 1000°C/hr (furnace cool) and the sample was retrieved and weighed. This allowed the LOI to be calculated using the following formula:

$$\%LOI = [(Filled\ Wt - Crucible\ Wt) - (Final\ Wt - Crucible\ Wt)] / Initial\ Wt \times 100.$$

The LOI gives an rough indication of the quantities of gas which volatilize from the powder during processing. After each run, observations were made on each glass. The samples were also photographed to provide a better comparison with respect to glass quality. The samples were then transferred to Environmental Technology for TCLP testing.

For a waste encapsulation technology to be acceptable, the waste must pass toxicity characteristic leaching procedure (TCLP) analysis for RCRA heavy metal contaminants. The surrogate sludge had been spiked with cadmium (Cd), chromium (Cr), barium (Ba), nickel (Ni), and lead (Pb) to test the leach resistance of the various glass frits. The samples from each completed melt experiment were transferred to Environmental Technologies (ET) for TCLP testing.

Samples for the TCLP analyses were size reduced per the SW-846 protocol. Leach levels were measured using an Inductively Coupled Plasma Mass Spectrometer (ICP-MS) located in Bldg. 881. These values can then be directly compared to maximum allowable treatment standards established by the EPA.⁽¹⁾

Offgas Analyses

TDMS measurements of constituents volatilized from selected powder formulations were performed. The sample numbers and frit identities, maximum temperatures, and formulations by weight are shown in Table 2.

Table 2. Sample Formulations Analyzed by TDMS

Sample ID	Maximum Temp (°C)	Frit (grams)	Sludge (grams)	Carbon (grams)	Total Wt (grams)
#1 3292	900	0.0515	0.0505	0.0000	0.1020
#2 3292C	900	0.0480	0.0482	0.0048	0.1010
#3 3292-2	975	0.0496	0.0495	0.0000	0.0991
#4 3292C-2	975	0.0474	0.0482	0.0049	0.1005
#5 3249	1014	0.0507	0.0508	0.0000	0.1015
#6 3249C	1014	0.0477	0.0467	0.0055	0.0999
#7 3110	1014	0.0503	0.0502	0.0000	0.1005
#8 3110C	1014	0.0470	0.0474	0.0049	0.0993
#9 3270	1014	0.0500	0.0499	0.0000	0.0999
#10 3270C	1014	0.0475	0.0476	0.0053	0.1004
#11 3225	1014	0.0502	0.0498	0.0000	0.1000
#12 3225C	1014	0.0477	0.0477	0.0050	0.1004

The instrumentation utilized for offgas analysis included a UTI[®] vacuum inlet TDMS, a Thermolyne[®] tube furnace, and an Omega[®] programmable temperature controller. The TDMS was calibrated prior to each analysis with gas flowrate calibration standards directly traceable to the National Institute for Standards and Technology (NIST). A quartz-glass tube ($\frac{3}{4}$ " diameter by 8" length) was used as a sample enclosure because of its high temperature resistance and vacuum integrity. Small crucibles ($\frac{1}{2}$ " diameter by 1" length) made of high purity alumina (99.8% Al_2O_3) were used as "disposable liners" to hold the powder samples during the analyses. These crucibles prevented the powder samples from sticking to the interior surfaces of the quartz tube and cross-contaminating subsequent samples. The quartz tube and crucibles were aqueous detergent cleaned and vacuum baked to remove background contaminant levels prior to being used for each quantitative analysis.

The surrogate waste was pulverized in a ball mill to homogenize the constituents. Each crucible was loaded with a nominal 0.10 gram powder sample. This quantity provided adequate offgas without "swamping" the TDMS, which would cause non-linear response and poor quantitative determination. The loaded crucible was placed into the quartz tube, the assembly attached to the inlet, and evacuated to less than 1×10^{-6} torr by the TDMS vacuum system. Powder samples were heated to maximum temperatures ranging from 900-1014°C, dependant on the sample. The temperature profile consisted of a ramp rate of 285°C/hour with a 0.5 hour soak at the maximum temperature. The "thermal lagtime" between the temperature reading of the thermocouple (next to quartz tube) and sample (inside quartz tube) was minimized by utilizing small tubes and ramping the temperature at a slow rate. A background scan of the ion currents of residual gases in the TDMS analyzer and quartz tube was taken. The furnace was started and followed the programmed temperature profile. The TDMS was programmed to scan every four minutes throughout the duration of the temperature profile. Each scan measured the temperature of the furnace, the clock time, and the ion currents (picoamperes) of the m/e's (atomic mass divided by ionic charge) throughout the range of the TDMS. The TDMS has a range of m/e 1-200. The scans were recorded on printouts as well as saved on the computer hard drive for subsequent processing. Photo 6 is a photograph of the TDMS instrumentation used for this project. Photo 7 is a closeup photograph of a quartz tube and alumina crucible before a sample was loaded. Photo 8 is a closeup photograph of the temperature controller, tube furnace, thermocouple, and quartz tube in position during analysis.

RESULTS AND DISCUSSION

Glass Formation

The first five melt experiments were conducted solely with the glass frit and the bypass sludge waste. The glass frit was randomly selected and weighed with the waste using 50.0 grams of each. The second series of experiments with carbon powder were performed in a similar fashion except that the waste and frit loading were decreased to 47.5 grams and a ground coconut charcoal (carbon) powder was added at 5.0 grams in each. The carbon may reduce iron oxide in the sludge from Fe_2O_3 to FeO . FeO can react with SiO_2 to produce additional liquid with a lower viscosity and increased crucible wetting at the processing temperatures.^[3] The reduction of Fe_2O_3 to FeO by carbon should mean additional CO or CO_2 evolution from the melt.

Ferro frit number 3110 is a common soda-lime-silica glass composition as these materials are the primary constituents. Similar compositions are used by the glass industry to produce clear container flint glass. The addition of Na_2O and CaO are termed glass modifiers as they modify the SiO_2 tetrahedron to break the Si-O bonds and produce an amorphous structure. Each Na_2O molecule breaks one silicon oxygen bond while each CaO molecule breaks 2 bonds. An analysis of the SiO_2 - Na_2O - CaO phase diagram^[2] shows this composition to have a melting temperature ranging from approximately 800°C up to 1200°C. The fusion temperature reported by Ferro (746°C) may not have been accurate. This frit was melted at 900°C in melt runs 2 and 8; the samples are shown in Photograph 3. Observations of these samples showed that the sample from run 2 did not melt but shrank considerably due to the powders sintering and densifying from liquid phase sintering. This produced a porous crystalline material lacking any glassy phase. This sample would not be acceptable based solely on appearance. The addition of carbon powder moderately improved the product as noted by an increase in the amount of amorphous material

present and increased the LOI from 10.0% to 18.9% with the addition of the carbon (Table 3).

Frit number 3225 is a silica-borate-aluminate glass composition. In this system, SiO_2 and B_2O_3 serve as glass formers, while Al_2O_3 may be a glass former or intermediate depending of the coordination number of Al in the structure. Intermediates are additives that may contribute in part to the network of the structure whereas modifiers break up the structure. Alumina is commonly added to glass to improve the durability of the resulting product. Analysis of the $\text{SiO}_2\text{-B}_2\text{O}_3\text{-Al}_2\text{O}_3$ ^[4] shows this composition to have a melting temperature in the range of $\approx 1200\text{-}1600^\circ\text{C}$. The other additives to the frit (Table 1) serve to further reduce the melting temperature. Frit 3225 was used in melt runs 1 and 6 (Table 3) with the samples shown in Photograph 5. Run 1 (w/o carbon) showed improved melting over frit 3110, which may in

Table 3: Melt Experimental Runs

Run	Batch	Crucible Wt.	Filled Wt.	Final Wt.	LOI (%)
1	3225	166.9	266.9	254.5	12.40
2	3110	171.7	271.7	261.7	10.00
3	3270	174.7	274.7	264.6	10.10
*4	3249	191.8	291.8	247.7	44.10
5	3292	195.0	295.0	284.7	10.30
6	3225	166.5	266.5	243.7	22.80
7	3292	168.0	268.0	246.6	21.40
8	3110	173.2	273.2	254.3	18.90
9	3270	375.7	475.7	454.4	21.30
10	3249	277.9	377.9	356.1	21.80
*11	**3249				ND
*12	#3225				ND

ND - No data available

* - Glass wet and flowed from crucible

** - Melting temperature of 1450°C

- Melting temperature 1350°C

part be due to the higher melting temperature used with this material. The melting, however, appeared to be incomplete due to the rough surface texture observed on the surface. A small amount of surface scale was also present. This scale was identified in previous studies to be a mixture of $\text{CaSO}_4\text{-Na}_2\text{SO}_4$.^[9] The addition of carbon powder to the material, however, improved the melt appearance producing a smooth glassy material and eliminating the scale (Photograph 5). This material wetted the Al_2O_3 crucible, indicating the presence of a molten (liquid) glass at the processing temperature of 1050°C . The LOI also nearly doubled from 12.4% to 22.8% due to the presence of carbon in the material. A third sample was melted at 1350°C and without carbon powder which also produced a glass of superior quality with the molten glass wetting and flowing from the Al_2O_3 crucible. This melting temperature, however, would be impractical for the microwave melter as the stainless steel drums would be at or above a safe operating limit at 1350°C .

Ferro frit number 3249 is a silica-borate-aluminate-magnesia glass composition. This glass frit had the highest melting temperature which is in part due to the presence of refractory oxides (MgO and Al_2O_3) in the frit. SiO_2 and B_2O_3 again serve as glass formers, while Al_2O_3 may be a glass former or intermediate depending of the coordination number of Al in the structure. The divalent Mg^{2+} cation is used as a glass modifier to break up the SiO_4^{2-} tetrahedron. The phase diagram for this system was not published, so melting temperatures can only be speculated and would be expected to be somewhat higher than the melting temperature for frit 3225. Frit 3249 was used in melt runs 4 and 10 (Photograph 2) and was judged to be the optimum glass frit based on the quality of the glass produced. There was only minimal difference between the samples from these runs as both yielded a good glass which wetted the Al_2O_3 crucible. The melt from run 4 was performed in a 250 ml crucible and the molten glass wetted the

crucible and flowed over the crucible's top edge during the run. The loss of material makes the LOI for this run meaningless. Run 10 was performed in a 500 ml crucible which contained the molten glass during melting. This sample had an LOI of 21.8% as shown in Table 3. A third sample of this material was melted at 1450°C and also produced a glass of ideal quality based on visual examination. This melt also wetted the Al_2O_3 crucible and corroded the refractory base in the furnace. This melting temperature would be too high for the stainless steel drums in microwave melting.

Frit number 3270 is a silica-borate-calcia glass composition. In this system, SiO_2 is the principle glass former while calcia is the glass modifier used to break silicon-oxygen bonds. Analysis of the phase diagram for this system shows the melting temperature to range from 1000-1200°C.^[6] This frit was used in melt runs 3 and 9 (Photograph 4). Run 3 (w/o carbon) showed improved melting over frit 3110. This may be due to the higher melting temperature used with this frit (975°C vs. 900°C). The melting, however, appeared to be incomplete due to the rough surface texture observed. A surface scale was also present on this sample which again was identified in previous studies to be CaSO_4 . The addition of carbon powder, however, improved the melt appearance resulting in a glassy material although the surface texture was somewhat irregular. This material wetted the Al_2O_3 crucible to a greater degree than in run 3, which indicates the presence of additional molten (liquid) glass at the processing temperature of 975°C. The LOI doubled from 10.1% to 21.3% due to the presence of carbon in the material. This was judged to be the ideal frit composition based on the quality of glass produced at the low processing temperature.

Ferro frit number 3292 is another silica-borate-calcia glass composition with considerable amounts of soda (Na_2O) and alumina in the structure. The melting temperature for this frit is higher due to the higher quantities of SiO_2 in the system. This was confirmed by the phase diagram which shows a range of melting temperatures between 1000 and 1300°C.^[6] This frit was used in melt runs 5 and 7 (Photograph 1) and both runs yielded a crusty material which appeared to be highly porous. Neither wet the Al_2O_3 crucible to any degree indicating that little liquid was present at the melting temperature of 1050°C. There was a considerable increase in the LOI with the use of carbon powder as the LOI increased from 10.3% to 21.4%. The quality of material produced from this frit was superior only to that produced using frit 3110 based on visual observations.

TCLP Analysis

After the melting operation was completed, the samples were photographed and transferred to ET for TCLP testing. The TCLP results are shown in Table 4.^[7] This data shows only six of the 12 samples passed the TCLP test. There was little correlation between glass quality and heavy metal leachability; samples which produced superior quality of glass (frits 3225, 3249 w/o carbon, and 3270) failed the TCLP. Frits which produced the poorest quality of material (frits 3110 and 3292) passed for all metals tested. Frit 3110 was observed to have a markedly higher extract solution pH than the other frits (Table 4) which may have buffered the TCLP acid leachate solution. The increased pH is most likely due to the higher Na_2O content in this material (Table 1). Increasing the melting temperature to approximately 1150-1200°C would improve the quality of glass based on an analysis of the phase diagram for this system. Additionally, adding carbon powder to frit 3249 enabled the sample to pass the TCLP test. This may have resulted from the waste content decreasing (50% to 47.5%) or more likely from the higher quality of glass produced. Increasing the melting temperature also aided in reducing the TCLP levels for the heavy metals tested. Increasing the melting temperature to 1350°C for frit 3225, however, did not show similar effects (Table 4). The reasons for this are unclear.

Based on the TCLP results on frit 3110, follow-up melting experiments were performed using a 50% frit/50% waste charge and melting temperatures of 1050°C, 1100°C, 1150°C, and 1200°C. This was based on the phase diagram for the soda-lime-silica system. The results from the 1050 and 1100°C melts showed improved melting, but did not produce a glassy product. The melted product was observed to be similar in appearance to volcanic rock with multiple pores present in the structure and no glassy phase present. Increasing the melting temperature to 1150-1200°C, however, improved the product quality with the 1200°C melt producing a glass. These two runs were observed to have an increased quantity of

surface scale ($\text{CaSO}_4\text{-Na}_2\text{SO}_4$) which was not observed on samples prepared from frit 3249.

Table 4: TCLP Experimental Data Expressed in Parts per Million

Run	Batch	pH	Ag	Cd	Cr	Ni	Pb
1	3225	4.85	0.237	0.035	0.160	< 0.050	1.31
2	3110	9.74	0.035	< 0.010	0.476	< 0.050	< 0.050
3	3270	5.01	0.195	2.36	0.227	< 0.050	9.68
4	3249	4.90	0.852	0.020	0.161	< 0.050	0.090
5	3292	4.94	0.201	0.017	0.240	< 0.050	< 0.050
6	3225	5.30	0.018	0.014	0.171	< 0.050	0.518
7	3292	5.19	0.156	0.034	0.151	< 0.050	0.140
8	3110	5.26	< 0.010	0.029	0.127	< 0.050	0.115
9	3270	5.46	< 0.010	2.19	0.181	< 0.050	9.35
10	3249	4.90	0.220	0.010	0.127	< 0.050	< 0.050
11	3249	4.95	0.022	< 0.010	0.070	< 0.050	< 0.050
12	3225	4.92	1.050	< 0.010	0.038	< 0.050	0.066
Universal Treatment Standard ⁽¹⁾			0.30	0.19	0.86	5.0	0.37

TDMS Offgas Analyses

To obtain TDMS offgas results, the hard disk data files from samples 1-12 were processed with customized software written by SW. Using this software, the following tasks were performed for each analysis:

- The background signal was subtracted from each m/e in the datafile, which is a matrix of 75 scans by 200 m/e's. Then a total of nine m/e's with significant ion currents were identified and selected for processing. A m/e was considered significant if it was higher than the detection limit of the TDMS. The detection limit for the TDMS is twice the electronic noise level, or approximately 0.1 microgram (μg). The significant m/e's were: m/e 12 carbon monoxide (CO^+), m/e 14 nitrogen (N_2^+), m/e 18 water (H_2O^+), m/e 30 nitrogen monoxide (NO^+), m/e 32 oxygen and m/e 32 sulfur (O_2^+/S^+), m/e 44 carbon dioxide (CO_2^+), m/e 46 nitrogen dioxide (NO_2^+), m/e 48 sulfur monoxide (SO^+), and m/e 64 sulfur dioxide (SO_2^+). These m/e's for each scan, as well as the corresponding clock time and furnace temperature, served as raw data for further processing. The raw data printouts for samples 1-12 are included in Appendix D, Raw Data Sets 1-12.
- The ion currents for the selected m/e's were multiplied by the flowrate sensitivity factors (moles per second) obtained by analyzing NIST traceable calibration standards (H_2 , CO , N_2 , CH_4 , H_2O , O_2 , CO_2) prior to each sample analysis. NIST standards were unavailable for NO , NO_2 , SO , and SO_2 , so their sensitivities were approximated by reference to the existing NIST standards.⁽⁹⁾
- These flowrate sensitivity corrected ion currents were multiplied by the molecular weight of each component. Number of micromoles, mole%, micrograms, and weight% were calculated and printed in tabular format for each component. These values have confidence limits of $\pm 30\%$, which represents the sum of errors inherent in the NIST standards and the TDMS method. The tabular printouts for samples 1-12 are included in Appendix C, Result Tables 1-12.
- The number of moles/second for each component were plotted against elapsed time and temperature to show the dynamic offgas profiles. These quasi three- dimensional (3-D) plots show relative quantities of the sample offgas components. 3-D profiles for samples 1-12 are included in Appendix B, Charts 1-12.

As the furnace heated the samples according to the programmed profile, the offgas components reached their maximum levels at consistent temperatures, which are summarized in Table 5. Using results from Result Tables 1-12, the offgas quantities (normalized for 1.00 gram of sample) of components from samples 1-12 are summarized in Table 6.

Table 5: Maximum Offgas Temperatures

Component	3292 (C°)	3292C (C°)	3292-2 (C°)	3292C-2 (C°)	3249 (C°)	3249C (C°)	3110 (C°)	3110C (C°)	3270 (C°)	3270C (C°)	3225 (C°)	3225C (C°)
CO	489	471	501	1014	484	979	946	964	507	902	495	999
N2	489	471	518	478	501	475	501	471	507	466	512	456
H2O	126	133	127	127	126	122	126	128	135	120	128	129
NO	489	471	501	478	501	457	501	471	507	466	512	456
O2/S	489	471	1014	987	972	969	1003	964	507	882	998	999
CO2	489	471	501	967	484	978	946	943	507	902	495	456
NO2	472	471	483	460	484	457	484	471	489	466	495	456
SO	903	902	1014	987	972	969	1003	943	1010	882	998	999
SO2	903	902	1014	987	972	969	1003	943	1010	882	998	999

Table 6: Offgas Quantities - Per Gram of Sample

Component	3292 (µg)	3292C (µg)	3292-2 (µg)	3292C-2 (µg)	3249 (µg)	3249C (µg)	3110 (µg)	3110C (µg)	3270 (µg)	3270C (µg)	3225 (µg)	3225C (µg)
CO	5685	24735	5592	49281	8507	59938	9247	54998	6897	50699	4585	40970
N2	23117	8817	13014	16636	8728	9157	20026	12663	8413	8105	26302	23911
H2O	59254	54070	77141	64347	56059	57337	69391	56753	16981	34088	121003	61884
NO	15052	14272	15787	15156	13402	13499	16255	14538	9195	8059	20039	12309
O2/S	15996	6878	52059	18384	32818	12417	60125	14887	15485	10243	27321	6887
CO2	6521	22211	10139	36306	8475	42748	11110	43528	4332	27961	9653	28437
NO2	1317	736	1358	1039	1051	791	1339	771	617	512	2968	737
SO	5084	11437	32332	31330	20255	21349	35593	27947	5269	15040	17359	11076
SO2	9910	22517	55732	57291	37529	40589	63540	50108	8608	27453	31206	20445
Total	141935	165674	263155	289772	186827	257829	286630	276195	75802	182165	260440	206660

The data presented in Tables 4-5, Charts 1-12, and Raw Data Sets 1-12 reveals the following results of the TDMS analyses:

- The offgas components volatilized in an ordered fashion with increasing temperature. H₂O was first and produced bimodal profiles with maximum levels occurring at a mean of 127°C. N₂, NO, and NO₂ were next with single mode profiles and maximum levels occurring at means of 487°C, 484°C, and 474°C, respectively. CO and CO₂ followed with single mode profiles and maximum levels occurring at means of 730°C and 678°C, respectively. The final components were O₂/S, SO, and SO₂, with single mode profiles and maximum levels occurring at means of 855°C, 965°C, and 965°C, respectively.
- The bimodal H₂O profiles indicate this component comes from several sources. The larger first mode is due to H₂O desorption from the sample enclosure and powder surfaces. The smaller second mode is due to H₂O of hydration released during the thermal decomposition of the surrogate waste formulation matrix. On average, samples with 5% carbon showed ≈18% less H₂O when compared to their counterpart samples without carbon.
- The components N₂, NO, and NO₂ are due to the thermal decomposition of nitrates in the surrogate waste formulation matrix. On average, samples with 5% carbon showed ≈20% less N₂, ≈13% less NO, and ≈47% less NO₂ when compared to their counterpart samples without carbon.
- The components CO and CO₂ are due to the thermal decomposition of carbonates present in the surrogate waste formulation matrix. The formulations containing 5% carbon showed increased quantities of these components due to reduction of Fe₂O₃ to FeO. On average, samples with 5% carbon showed ≈593% more CO and ≈300% more CO₂ when compared to their counterpart samples without carbon.
- The components O₂/S, SO, and SO₂ are due to the thermal decomposition of sulfates in the surrogate waste formulation matrix. On average, samples with 5% carbon showed ≈66% less O₂/S, ≈2% more SO, and ≈6% more SO₂ when compared to their counterpart samples without carbon.
- The lack of hydrocarbon components above background levels indicates the absence of significant organic species in the formulation matrices.

CONCLUSIONS

Glass Formation

- Ferro frit 3249 produced the optimum quality of glass based on visual observations of the samples. Carbon powder did not affect the quality of glass produced from this frit composition, but did have a beneficial effect in reducing the leachability of silver to acceptable limits.
- Ferro frits 3225 and 3270 produced the next best quality of glass when melted using a 47.5 waste/47.5 frit/5 carbon powder charge. A poorer quality of glass was produced when carbon powder was omitted with these frits. Both sets of samples for frit 3225 failed the TCLP test for lead. Both sets of samples for frit 3270 failed the TCLP test for cadmium and lead.
- Ferro frits 3110 and 3292 produced the poorest quality of glass but passed TCLP tests for Ag, Cd, Cr, Ni, and Pb. The addition of carbon powder did not alter the TCLP results for these frit compositions.
- LDR compliant wastes can be produced using a 47.5% waste/47.5% frit 3249/5% carbon powder melted at 1200°C or a 50% waste/50% frit 3110 melted at 900°C.
- Increasing the melting temperature for frit 3110 from 900°C to 1200°C considerably improves the quality of the waste product, but yielded a sulfate based surface scale. This scale could be reduced or eliminated by incorporating carbon powder as a raw material in melt runs.

TDMS Offgas Analyses

- The TDMS identified and quantified CO, N₂, H₂O, NO, O₂/S, CO₂, NO₂, SO, and SO₂ volatilized from the powder samples.

- For samples containing 5% carbon, the TDMS detected higher levels of CO, CO₂, SO, and SO₂, and lower levels of N₂, H₂O, NO, O₂/S, NO₂, SO, and SO₂ when compared to their counterpart samples without carbon. These components are due to degassing and thermal decomposition of carbonates, nitrates, sulfates, and water in the formulation matrices. The increased quantities of CO and CO₂ in the 5% carbon samples could be a result of carbon reduction of Fe₂O₃ to FeO.
- The bimodal H₂O profiles indicate this component comes from several sources. The larger first mode is due to H₂O desorption from the sample enclosure and powder surfaces. The smaller second mode is due to H₂O of hydration released during the thermal decomposition of the surrogate waste formulation matrix.
- The offgas components volatilized in an ordered fashion with increasing temperature.
- The lack of hydrocarbon components above background levels indicates the absence of significant organic species in the formulation mixtures.

RECOMMENDATIONS

- Ferro frit 3249 merits further evaluation in the microwave melter process. This material, when melted at 1200°C using a 47.5% waste/47.5% frit/5% carbon powder produces a waste which meets land disposal restriction (LDR) requirements.
- Ferro frit 3110 also merits further consideration as a raw material and produces a LDR compliant waste using a 50% waste loading. This frit does not produce a similar quality of product as frit 3249 when melted at 900°C, but the quality is improved by melting at 1200°C.
- Ferro frits 3225, 3270, and 3292 also do not merit further consideration as raw material sources based on the melting and TCLP performance observed during this work.
- On-line offgas measurement of components volatilized by the production microwave melter unit should be performed and compared to the results obtained during this study.

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Appendix A

Photographs 1-8

Ferro Glass Frit 3292
50% Glass-50% Waste
1050 C Melting Temperature

Ferro Glass Frit 3292
47.5% Glass-47.5% Waste-5% Carbor
1050 C Melting Temperature

Ferro Glass Frit 3249
47.5% Glass-17.5% Waste-5% Carbo
1200 C Melting Temperature

Ferro Glass Frit 3249
50% Glass-50% Waste
1200 C Melting Temperature

Ferro Glass Frit 3110
47.5% Glass-47.5% Waste-5% Carbon
900 C Melting Temperature

Ferro Glass Frit 3110
50% Glass-50% Waste
900 C Melting Temperature

Ferro Glass Frit 3270
50% Glass-50% Waste
975 °C Melting Temperature

Ferro Glass Frit 3270
47.5% Glass-47.5% Waste-5% Carbon
975 °C Melting Temperature

Ferro Glass Frit 3225
47.5% Glass-47.5% Waste-5% Carb
1050 C Melting Temperature

Ferro Glass Frit 3225
50% Glass-50% Waste
1050°C Melting Temperature

TD95-002 Page A-8
Photo 7 Close up of quartz tube
and ceramic crucible

Photo 8 Close up of quartz tube
being heated inside tube furnace

Appendix B

3-D Dynamic Offgas Profile

Charts 1-12

Maximum Temperature = 903 Degrees C
Ion Currents For Selected Components

Time vs Moles/Sec for all Components

Maximum Temperature = 903 Degrees C
 Ion Currents For Selected Components

Customer: V. Eschen
 Sample Date: 7 Nov 1994
 Sample: MWM3292C
 Datafile: MWM3292C

Time vs Moles/Sec for all Components

Time vs Moles/Sec for all Components

Time vs Moles/Sec for all Components

Maximum Temperature = 979 Degrees C
Ion Currents For Selected Components

Customer: V. Eschen
Sample Date: 8 Nov 1994
Sample: MWM3249
Datafile: MWM3249

Time vs Moles/Sec for all Components

Customer: V. Eschen
 Sample Date: 9 Nov 1994
 Sample: MWM3249C
 Datafile: MW3249C

Time vs Moles/Sec for all Components

Customer: V. Eschen
Sample Date: 10 Nov 1994
Sample: MWM3110
Datafile: MWM3110

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Time vs Moles/Sec for all components

Maximum Temperature = 1015 Degrees C
 Ion Currents for Selected Components

Customer: V. Eschen
 Sample Date: 14 Nov 1994
 Sample: MWM3270
 Datafile: MWM3270

Time vs Moles/Sec for all Components

Customer: V. Eschen
Sample Date: 15 Nov 1994
Sample: MWM3270C
Datafile: MWM3270C

Time vs Moles/Sec for all Components

Customer: V. Eschen
 Sample Date: 7 Dec 1994
 Sample: MWM3225
 Datafile: MW3225

Time vs Moles/Sec for all Components

Customer: V. Eschen
 Sample Date: 8 Dec 1994
 Sample: MWM3225C
 Datafile: MWM3225C

Appendix C

Result Tables 1-12

Customer Name = V. Eschen
 Sample = MWM3292
 Sample Date = 2 Nov 1994
 Number of Components = 9
 Sample Weight = 1.0000 Grams

DYNAMIC OUTGAS RESULTS OF SAMPLE

Component	Micromoles	Mole Percent	Micrograms	Weight Percent
0	203.04	3.53	5685.13	4.01
2	825.61	14.33	23117.19	16.29
20	3291.88	57.15	59253.88	41.75
0	501.75	8.71	15052.48	10.61
2/S	499.86	8.68	15995.58	11.27
02	148.19	2.57	6520.50	4.59
02	28.63	.50	1316.83	.93
0	105.91	1.84	5083.58	3.58
02	154.84	2.69	9910.08	6.98
TOTAL	5759.72	100.00	141935.25	100.00

The values in the table above have been corrected for the sample weight, and are expressed in terms of numbers of micromoles and micrograms per 1.0000 gram of sample analyzed.

Customer Name = V. Eschen
Sample = MWM3292C
Sample Date = 7 Nov 1994
Number of Components = 9
Sample Weight = 1.0000 Grams

DYNAMIC OUTGAS RESULTS OF SAMPLE

Component	Micromoles	Mole Percent	Micrograms	Weight Percent
CO	883.41	14.71	24735.45	14.93
N2	314.89	5.24	8817.04	5.32
H2O	3003.89	50.03	54070.01	32.64
NO	475.74	7.92	14272.26	8.61
O2/S	214.95	3.58	6878.24	4.15
CO2	504.78	8.41	22210.54	13.41
NO2	16.00	.27	736.06	.44
SO2	238.26	3.97	11436.54	6.90
SO2	351.83	5.86	22517.42	13.59
TOTAL	6003.76	100.00	165673.57	100.00

The values in the table above have been corrected for the sample weight, and are expressed in terms of numbers of micromoles and micrograms per 1.0000 gram of sample analyzed.

Customer Name = V. Eschen
Sample = 3292-2
Sample Date = 1 Dec 1994
Number of Components = 9
Sample Weight = 1.0000 Grams

DYNAMIC OUTGAS RESULTS OF SAMPLE

Component	Micromoles	Mole Percent	Micrograms	Weight Percent
CO	199.71	2.24	5591.95	2.12
N2	464.79	5.22	13014.22	4.95
H2O	4285.63	48.11	77141.37	29.31
NO	526.26	5.91	15787.66	6.00
O2/S	1626.83	18.26	52058.56	19.78
CO2	230.42	2.59	10138.62	3.85
NO2	29.53	.33	1358.38	.52
SO	673.58	7.56	32331.93	12.29
SO2	870.82	9.78	55732.43	21.18
TOTAL	8907.58	100.00	263155.12	100.00

The values in the table above have been corrected for the sample weight, and are expressed in terms of numbers of micromoles and micrograms per 1.0000 gram of sample analyzed.

Customer Name = V. Eschen
Sample = 3292C-2
Sample Date = 2 Dec 1994
Number of Components = 9
Sample Weight = 1.0000 Grams

DYNAMIC OUTGAS RESULTS OF SAMPLE

Component	Micromoles	Mole Percent	Micrograms	Weight Percent
CO	1760.03	18.72	49280.97	17.01
N2	594.14	6.32	16635.98	5.74
H2O	3574.85	38.01	64347.30	22.21
NO	505.20	5.37	15156.06	5.23
O2/S	574.51	6.11	18384.38	6.34
CO2	825.14	8.77	36306.24	12.53
NO2	22.58	.24	1038.90	.36
SO	652.72	6.94	31330.52	10.81
SO2	895.18	9.52	57291.55	19.77
TOTAL	9404.37	100.00	289771.90	100.00

The values in the table above have been corrected for the sample weight, and are expressed in terms of numbers of micromoles and micrograms per 1.0000 gram of sample analyzed.

Customer Name = V. Eschen
Sample = MWM3249C
Sample Date = 9 Nov 1994
Number of Components = 9
Sample Weight = 1.0000 Grams

DYNAMIC OUTGAS RESULTS OF SAMPLE

Component	Micromoles	Mole Percent	Micrograms	Weight Percent
CO	2140.67	25.01	59938.73	23.25
N2	327.06	3.82	9157.70	3.55
H2O	3185.40	37.22	57337.28	22.24
NO	449.98	5.26	13499.34	5.24
O2/S	388.05	4.53	12417.65	4.82
CO2	971.55	11.35	42748.32	16.58
NO2	17.20	.20	791.11	.31
SO	444.79	5.20	21349.93	8.28
SO2	634.21	7.41	40589.31	15.74
TOTAL	8558.91	100.00	257829.37	100.00

The values in the table above have been corrected for the sample weight, and are expressed in terms of numbers of micromoles and micrograms per 1.0000 gram of sample analyzed.

Customer Name = V. Escher
Sample = MWM3110
Sample Date = 10 Nov 1994
Number of Components = 9
Sample Weight = 1.0000 Grams

DYNAMIC OUTGAS RESULTS OF SAMPLE

Component	Micromoles	Mole Percent	Micrograms	Weight Percent
CO	330.26	3.54	9247.34	3.23
N2	715.25	7.66	20026.95	6.99
H2O	3855.10	41.29	69391.80	24.21
NO	541.85	5.80	16255.35	5.67
O2/S	1878.92	20.12	60125.45	20.98
CO2	252.52	2.70	11110.72	3.88
NO2	29.13	.31	1339.87	.47
SO	741.52	7.94	35593.16	12.42
SO2	992.81	10.63	63540.07	22.17
TOTAL	9337.36	100.00	286630.69	100.00

The values in the table above have been corrected for the sample weight, and are expressed in terms of numbers of micromoles and micrograms per 1.0000 gram of sample analyzed.

Customer Name = V. Eschen
Sample = MWM3110C
Sample Date = 11 Nov 1994
Number of Components = 9
Sample Weight = 1.0000 Grams.

DYNAMIC OUTGAS RESULTS OF SAMPLE

Component	Micromoles	Mole Percent	Micrograms	Weight Percent
CO	1964.22	22.09	54998.26	19.91
N2	452.26	5.09	12663.18	4.58
H2O	3152.95	35.46	56753.01	20.55
NO	484.60	5.45	14538.14	5.26
O2/S	465.23	5.23	14887.27	5.39
CO2	989.28	11.13	43528.32	15.76
NO2	16.77	.19	771.47	.28
SO	582.23	6.55	27947.22	10.12
SO2	782.94	8.81	50108.15	18.14
TOTAL	8890.48	100.00	276195.02	100.00

The values in the table above have been corrected for the sample weight, and are expressed in terms of numbers of micromoles and micrograms per 1.0000 gram of sample analyzed.

Customer Name = V. Eschen
Sample = MWM3270
Sample Date = 14 Nov 1994
Number of Components = 9
Sample Weight = 1.0000 Grams

DYNAMIC OUTGAS RESULTS OF SAMPLE

Component	Micromoles	Mole Percent	Micrograms	Weight Percent
CO	246.33	9.34	6897.33	9.10
N2	300.47	11.39	8413.17	11.10
H2O	943.44	35.78	16981.97	22.40
NO	306.52	11.62	9195.55	12.13
O2/S	483.93	18.35	15485.79	20.43
CO2	98.47	3.73	4332.74	5.72
NO2	13.43	.51	617.73	.81
SO	109.77	4.16	5269.03	6.95
SO2	134.51	5.10	8608.84	11.36
TOTAL	2636.88	100.00	75802.15	100.00

The values in the table above have been corrected for the sample weight, and are expressed in terms of numbers of micromoles and micrograms per 1.0000 gram of sample analyzed.

Customer Name = V. Escher
Sample = MWM3270C
Sample Date = 15 Nov 1994
Number of Components = 9
Sample Weight = 1.0000 Grams

DYNAMIC OUTGAS RESULTS OF SAMPLE

Component	Micromoles	Mole Percent	Micrograms	Weight Percent
CO	1810.69	30.32	50699.42	27.83
N2	289.46	4.85	8105.00	4.45
H2O	1893.80	31.71	34088.36	18.71
NO	268.66	4.50	8059.84	4.42
O2/S	320.11	5.36	10243.46	5.62
CO2	635.50	10.64	27961.93	15.35
NO2	11.15	.19	512.83	.28
SO	313.35	5.25	15040.57	8.26
SO2	428.97	7.18	27453.95	15.07
TOTAL	5971.69	100.00	182165.35	100.00

The values in the table above have been corrected for the sample weight, and are expressed in terms of numbers of micromoles and micrograms per 1.0000 gram of sample analyzed.

Customer Name = V. Eschen
Sample = MWM3225
Sample Date = 7 Dec 1994
Number of Components = 9
Sample Weight = 1.0000 Grams

DYNAMIC OUTGAS RESULTS OF SAMPLE

Component	Micromoles	Mole Percent	Micrograms	Weight Percent
CO	163.77	1.56	4585.48	1.76
N2	939.37	8.96	26302.40	10.10
H2O	6722.41	64.14	121003.31	46.46
NO	667.97	6.37	20039.03	7.69
O2/S	853.80	8.15	27321.57	10.49
CO2	219.39	2.09	9653.01	3.71
NO2	64.54	.62	2968.88	1.14
SO	361.67	3.45	17359.93	6.67
SO2	487.60	4.65	31206.68	11.98
TOTAL	10480.51	100.00	260440.29	100.00

The values in the table above have been corrected for the sample weight, and are expressed in terms of numbers of micromoles and micrograms per 1.0000 gram of sample analyzed.

Customer Name = V. Escher
Sample = MWM3225C
Sample Date = 8 Dec 1994
Number of Components = 9
Sample Weight = 1.0000 Grams

DYNAMIC OUTGAS RESULTS OF SAMPLE

Component	Micromoles	Mole Percent	Micrograms	Weight Percent
CO	1463.24	19.27	40970.68	19.83
N2	853.97	11.25	23911.08	11.57
H2O	3438.04	45.28	61884.68	29.95
NO	410.31	5.40	12309.37	5.96
O2/S	215.25	2.83	6887.94	3.33
CO2	646.30	8.51	28437.09	13.76
NO2	16.04	.21	737.62	.36
SO	230.76	3.04	11076.71	5.36
SO2	319.46	4.21	20445.60	9.89
TOTAL	7593.36	100.00	206660.77	100.00

The values in the table above have been corrected for the sample weight, and are expressed in terms of numbers of micromoles and micrograms per 1.0000 gram of sample analyzed.

Appendix D

TDMS Raw Data

Sets 1-12

CO FILE NAME = MW3292
CUSTOMER NAME = V. Eschen
SAMPLE = MWM3292
SAMPLE DATE = 2 Nov 1994
NUMBER OF MASSES = 9
NUMBER OF SCANS = 75

***** MAIN ARRAY *****

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11
Row1	TIME	TEMP	M/E12	M/E14	M/E18	M/E30	M/E32	M/E44	M/E46	M/E48	M/E64
Row2	Backgd	=	136	125	4171	119	29	721	37	26	29
Row3	8.12	22	277	188	381127	138	38	1222	47	27	30
Row4	8.15	38	208	158	156415	130	35	1095	43	27	29
Row5	8.18	72	191	162	150058	125	35	1230	44	28	29
Row6	8.21	96	240	167	194783	132	34	1792	48	27	32
Row7	8.24	113	324	185	287546	144	36	2674	52	26	30
Row8	8.28	113	525	334	1208737	189	48	4850	80	33	36
Row9	8.31	120	1919	16161091	7630	756	215	23993	423	95	157
Row10	8.34	126	4212	440837897	7400	2737	836	57205	1244	269	405
Row11	8.38	133	3075	311920057	610	1459	339	28257	625	153	206
Row12	8.41	140	2009	196810331	610	854	183	20313	406	94	127
Row13	8.45	146	1501	1188	4984230	688	119	15921	280	67	93
Row14	8.48	153	1132	736	2195667	820	78	12511	190	50	63
Row15	8.51	160	888	573	800718	1594	60	10260	145	40	50
Row16	8.54	166	870	597	437751	3215	54	9367	124	35	45
Row17	8.58	173	785	750	343105	5631	56	9378	116	36	42
Row18	9.01	180	746	1018	288847	9384	62	9150	112	33	40
Row19	9.04	187	819	1332	283917	13222	71	10141	107	34	40
Row20	9.08	193	815	1598	284655	18606	77	10482	111	34	40
Row21	9.11	200	843	2147	296630	25456	94	11714	114	34	40
Row22	9.14	212	932	2898	364793	38807	122	13512	129	33	40
Row23	9.18	230	1582	5622	644702	69819	203	21851	181	35	44
Row24	9.21	247	2620	11635	1439414	147363	395	43385	297	42	52
Row25	9.24	264	4471	21180	2323500	285737	686	75457	491	47	58
Row26	9.28	281	6347	33455	2947425	440367	1017	99686	553	52	65
Row27	9.31	298	8743	41891	4285368	533662	1520	157032	866	62	85
Row28	9.34	315	12892	486851573	2360	812590	3022	235063	1321	135	179
Row29	9.38	332	20516	68397169850	30	1074115	6864	379149	2962	159	193
Row30	9.41	350	20682	46844	5722680	583545	13603	335219	9838	143	129
Row31	9.45	367	19756	41367	1716360	540023	49095	312578	33916	237	132
Row32	9.48	384	21236	49161	1110890	642762	108632	365208	56494	398	194
Row33	9.52	402	23088	63767	955979	802514	200337	354967	89466	547	221
Row34	9.55	419	25512	78569	760864	1048485	313170	388029	138454	752	226
Row35	9.59	437	26241	117813	694221	1461597	484852	398229	190801	997	244
Row36	10.02	455	28079	164895	574359	2168980	768841	434746	260973	1255	261
Row37	10.06	472	31750	261839	474080	3441130	1363143	518287	318572	1453	321
Row38	10.09	489	35422	399890	378136	5378640	2620670	585660	244406	1313	353
Row39	10.13	507	27238	320077	244950	3943760	2100800	384369	45512	353	178
Row40	10.16	524	20871	82113	142842	850206	515087	335676	3057	60	66
Row41	10.19	541	22968	23932	108536	279550	143443	333030	1695	43	48
Row42	10.23	558	17879	15064	73781	153527	65815	236023	1101	38	41
Row43	10.26	575	41502	3919	60598	46110	31634	171018	820	33	38
Row44	10.30	592	9262	3087	52348	30871	29128	126986	617	33	37
Row45	10.33	608	7252	2441	47374	22532	28590	100104	517	33	37
Row46	10.36	625	6473	2103	40572	19960	27095	88515	433	33	35
Row47	10.40	642	5810	1918	37385	14467	22097	76258	386	32	39

Row50 10.50	737	5148	1715	31827	9324	14525	15271	377	11	101
Row51 10.53	737	5531	1678	28127	8152	14893	73547	376	171	247
Row52 10.56	718	5025	1572	28072	7153	12375	75468	362	360	538
Row53 10.59	729	5249	1453	22554	6279	10647	70768	356	708	1063
Row54 11.02	739	4913	1312	20959	5371	9521	67876	360	1388	2082
Row55 11.06	750	4793	1330	19093	5743	8939	65286	331	2843	4272
Row56 11.10	762	4183	1202	16688	5979	9610	50551	325	5472	8016
Row57 11.13	773	3383	1247	15697	5691	11543	46527	274	9720	14457
Row58 11.16	784	2698	1262	15439	6688	16018	36061	269	16304	24800
Row59 11.20	795	1788	1291	14292	8251	22080	24396	292	26172	40546
Row60 11.23	806	1578	1419	14583	10231	30743	18167	318	41339	58241
Row61 11.26	817	1311	1671	15332	14421	47726	13866	415	57848	81638
Row62 11.30	829	1050	2137	15808	20281	67491	11964	544	75481	111765
Row63 11.33	840	1023	2533	16486	28735	100401	10815	756	104995	152297
Row64 11.37	851	1188	3404	18028	39372	147010	10233	1069	150081	220440
Row65 11.40	863	1198	4479	18970	54341	206979	11259	1621	199120	309793
Row66 11.43	874	1323	6238	21912	73580	368040	13942	2519	284561	403616
Row67 11.47	886	1594	8267	25039	105936	420235	16600	4842	379926	584053
Row68 11.50	897	1671	3898	26392	37987	565671	15472	3173	535928	803292
Row69 11.54	903	1816	2504	26557	18523	655162	16429	2555	610300	873860
Row70 11.57	903	1471	1569	22665	9181	609228	12834	2153	552079	782296
Row71 12.01	901	1398	1363	19838	7025	511119	11135	1896	448495	686635
Row72 12.04	901	1196	1132	17218	5485	449909	9565	1720	437687	608411
Row73 12.08	901	1101	1069	16924	5040	394576	7756	1546	373735	543357
Row74 12.11	901	1013	934	15572	4497	366609	7048	1465	333347	504910
Row75 12.15	901	938	870	15301	3991	353118	7157	1340	306766	468691
Row76 12.18	900	837	806	14846	3445	314041	6415	1275	300214	412494
Row77 12.22	894	768	722	13490	2696	195999	4929	877	162889	226986

FILE NAME = MW3292C
CUSTOMER NAME = V. Eschen
SAMPLE = MWM3292C
SAMPLE DATE = 7 Nov 1994
NUMBER OF MASSES = 9
NUMBER OF SCANS = 75

***** MAIN ARRAY *****

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11
Row1	TIME	TEMP	M/E12	M/E14	M/E18	M/E30	M/E32	M/E44	M/E46	M/E48	M/E64
Row2	Backgnd	=	256	251	59659	347	100	1999	96	75	82
Row3	7.42	22	326	340	467910	387	114	2539	111	81	89
Row4	7.45	42	279	255	167218	316	98	2031	101	75	79
Row5	7.49	73	257	246	141037	304	94	2031	99	73	78
Row6	7.52	97	264	236	164517	295	96	2234	99	72	78
Row7	7.55	113	290	246	208212	322	98	2521	99	72	77
Row8	7.59	114	330	261	299283	369	106	3031	108	75	79
Row9	8.01	120	443	391	1301720	458	146	4307	146	91	97
Row10	8.05	126	1073	120710257690	1247	1054	19752	646	422	561	
Row11	8.08	133	2581	279630296100	2882	5044	35117	1169	947	1109	
Row12	8.11	140	2084	207018378100	1552	2441	22836	640	466	529	
Row13	8.15	146	1889	1446 8981200	954	1210	17761	416	267	304	
Row14	8.18	153	1576	1033 5491330	782	739	15108	301	166	198	
Row15	8.22	160	1149	810 3601330	881	580	13826	241	128	147	
Row16	8.25	167	1152	640 2050250	1270	385	11777	193	100	116	
Row17	8.28	173	1077	632 1135260	2162	290	10517	168	92	102	
Row18	8.32	180	879	673 520682	3728	217	9335	144	84	91	
Row19	8.35	186	837	901 366681	6730	191	9561	133	81	88	
Row20	8.38	193	811	1137 318614	9600	173	9439	132	81	89	
Row21	8.41	199	896	1456 291978	13336	167	9362	133	81	89	
Row22	8.45	211	895	1864 309779	19547	170	10479	134	82	92	
Row23	8.48	230	1130	2962 394016	32518	212	14756	145	86	92	
Row24	8.51	247	1773	4932 692510	60876	328	23279	192	88	98	
Row25	8.55	264	2829	10845 1563523	124670	591	43608	311	96	111	
Row26	8.58	281	4457	20033 2163619	250220	950	66900	462	105	121	
Row27	9.01	298	6196	30496 2364810	376840	1361	84760	528	110	124	
Row28	9.05	314	10171	38679 4783900	467640	2260	149000	809	157	180	
Row29	9.08	332	12235	4715412555230	679960	4820	175460	1248	308	382	
Row30	9.11	349	17706	6415811371700	846290	8252	265390	1960	322	364	
Row31	9.15	367	19056	46745 4206970	582580	10184	276920	7379	363	428	
Row32	9.18	384	19725	46266 1263497	536900	33197	276520	23593	481	477	
Row33	9.22	401	23517	53936 903750	625660	74550	336630	48071	504	370	
Row34	9.25	418	29481	68847 747127	835560	142740	389730	75310	612	408	
Row35	9.29	436	37729	102059 673534	1229970	215840	485470	104410	755	449	
Row36	9.32	453	54288	168570 647931	2095600	345500	871300	148920	1025	535	
Row37	9.36	471	201713	476400 890566	6604100	571790	3301700	190510	1518	954	
Row38	9.39	488	134068	359908 513809	3704800	380810	1566200	30642	409	363	
Row39	9.43	506	58949	131556 218716	1386700	252170	701310	5301	154	165	
Row40	9.46	523	41785	58888 134103	612460	122320	500750	2606	110	113	
Row41	9.50	540	40898	25182 102501	261540	52411	541230	2354	94	101	
Row42	9.53	557	47602	10087 94387	90390	12910	646560	2720	87	95	
Row43	9.56	574	40166	4145 76496	40947	4038	541960	2396	86	93	
Row44	10.00	591	34160	2881 68370	23887	2362	451300	1852	82	88	
Row45	10.03	608	27319	2397 60913	18620	1598	299950	1361	83	90	
Row46	10.06	625	20426	2161 52555	16481	1032	237650	1034	83	89	
Row47	10.10	641	15188	2065 49266	14001	720	183890	744	91	98	

Row50	10.20	691	12958	1627	41560	7635	430	153600	664	213	989
Row51	10.23	707	14191	1571	39232	6803	515	138590	659	665	966
Row52	10.26	717	13853	1458	37449	6095	829	130800	606	1675	2518
Row53	10.30	728	12961	1417	33505	4407	1361	130280	574	3998	6329
Row54	10.33	739	11781	1341	33138	4576	2870	118180	536	9049	13324
Row55	10.36	750	12724	1173	33331	5042	5682	117250	555	18519	27946
Row56	10.40	761	13477	1218	35140	4926	10860	116820	635	35188	55385
Row57	10.43	773	13372	1180	38008	5192	19062	122570	745	62210	88040
Row58	10.47	784	14040	1229	41572	5310	25836	126060	849	88630	132650
Row59	10.50	796	16533	1262	43310	6384	38835	131540	1009	124740	197230
Row60	10.54	807	18381	1377	45067	7089	46515	141300	1154	150870	229410
Row61	10.57	819	19906	1577	49845	8947	58196	153810	1258	196610	269120
Row62	11.01	831	26625	1821	57146	11437	66340	170910	1464	228130	366470
Row63	11.04	842	30369	2241	65304	13577	84180	224170	1789	280120	439680
Row64	11.08	854	40179	2714	78596	18067	108360	290850	2477	359790	548540
Row65	11.11	866	56054	3526	103171	23323	140800	424570	3212	510380	795500
Row66	11.15	878	84136	4783	128095	32667	225160	681800	5287	757900	1109800
Row67	11.18	890	120479	5995	182055	45491	297910	1091900	7966	1123900	1663700
Row68	11.22	902	171904	7683	229916	51167	447280	1468500	10469	1386500	2196600
Row69	11.26	903	161393	6253	186164	26633	391400	1331000	8976	1282700	1753800
Row70	11.30	902	125064	4319	122156	15737	292390	864500	6212	940300	1371600
Row71	11.33	901	100212	3357	94992	9854	217960	647620	5168	722300	1006700
Row72	11.37	901	81495	2713	71789	7426	172320	514900	3730	593150	839400
Row73	11.41	901	67403	2341	57152	6086	152910	397390	3126	466180	720920
Row74	11.44	901	60681	2104	48628	4676	139560	337600	2735	421650	616450
Row75	11.48	900	53625	1875	43064	4511	120890	273840	2414	366350	553670
Row76	11.52	898	44492	1531	35564	3140	82660	176360	1574	243240	322320
Row77	11.55	788	4317	393	16186	575	9935	14884	249	27059	34992

AME = MW3292_2
 = V. Eschen
 = 3292-2
 E = 1 Dec 1994
 MASSES = 9
 SCANS = 75

***** MAIN ARRAY *****

Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11
M/E12	M/E14	M/E18	M/E30	M/E32	M/E44	M/E46	M/E48	M/E64
172	508	4199	159	91	750	57	147	191
226	657	222240	218	167	1006	71	184	229
175	460	73746	158	119	903	60	149	168
157	384	53400	148	100	829	55	141	174
155	362	61634	142	98	811	55	138	168
172	381	85422	141	100	1016	56	135	172
206	395	190750	156	117	1487	65	161	206
341	612	1185060	274	286	3148	125	358	417
1549	233118995000	2714	5183	27962	1170	4617	5372	
1692	224815697000	1663	4263	18390	712	2458	3119	
1233	1467	8298100	737	1771	12872	384	1174	1477
942	955	4385800	511	1013	8599	222	698	849
667	632	1706450	316	457	5959	133	377	459
529	410	473890	338	242	5082	93	230	272
478	403	264380	631	175	5017	77	186	223
460	407	209674	1288	150	4436	73	171	222
464	478	160734	2201	152	4518	71	167	209
426	574	149512	3626	145	4830	70	157	209
439	671	139672	5205	142	4860	69	145	196
451	901	130904	6785	141	5166	69	151	199
506	1140	151750	9523	147	5378	72	149	193
634	1708	178637	16841	180	6990	83	153	202
923	3111	327380	32421	235	11904	113	168	213
1463	6426	761530	70470	418	24113	196	223	260
2409	11612	1188670	134170	699	39094	292	276	324
4226	18037	1520250	196350	940	53455	338	321	376
5563	22351	2074910	260950	1418	90504	523	406	545
8802	29454	7453900	398550	3723	140680	947	1047	1291
12830	4372810454600	629830	6184	212350	1747	1325	1566	
14589	31145	4512710	346720	6551	200650	5388	848	963
12980	24462	1363490	259680	19839	160370	16574	663	759
12054	27057	604910	283700	45290	153150	29726	617	661
12939	33002	465210	346280	73220	153950	42254	629	638
12667	45201	417350	443950	115630	160340	61970	781	610
12883	58763	371491	591320	181610	175220	78710	917	616
17207	84726	307399	954960	300310	222360	107910	1129	812
23402	132134	292830	1579200	519218	316680	123010	1330	904
27375	182313	260397	2059600	882610	383480	109230	1400	1115
21896	192385	193942	1919700	1086440	268950	41456	894	827
12520	93807	104781	968910	491130	155130	4334	354	359
13396	23012	68128	205330	102300	162800	1033	168	195
13069	7710	51819	70370	29750	139950	708	124	153
9190	3459	43130	31057	13718	101350	532	106	131
7025	2070	35793	17243	10423	83870	370	98	123
5711	1588	33839	12594	9434	63780	315	100	121
4592	1296	27343	10664	8118	53408	256	95	121

FILE NAME = MW3292C_2
 CUSTOMER NAME = V. Eschen
 SAMPLE = 3292C-2
 SAMPLE DATE = 2 Dec 1994
 NUMBER OF MASSES = 9
 NUMBER OF SCANS = 75

***** MAIN ARRAY *****

Row1	TIME TEMP	M/E12	M/E14	M/E18	M/E30	M/E32	M/E44	M/E46	M/E48	M/E54
Row2	Backand =	122	99	1835	63	71	670	37	96	123
Row3	7.49 31	164	3106	225490	94	5384	987	41	131	164
Row4	7.52 64	158	1961	117575	77	3451	953	39	112	143
Row5	7.55 90	163	1285	112077	80	2198	1029	40	118	144
Row6	7.59 110	179	775	129306	94	1408	1274	40	112	144
Row7	8.02 114	208	581	203139	117	1021	1832	43	127	162
Row8	8.05 119	252	538	1247350	192	1079	3026	65	283	358
Row9	8.08 125	1668	154319200300	1293	8541	31605	644	4281	5357	
Row10	8.12 132	1566	134715501200	893	4217	16817	348	1972	2333	
Row11	8.15 138	1118	881	732640	454	2142	11555	192	870	1208
Row12	8.18 145	844	687	3983100	295	1062	8820	129	588	701
Row13	8.22 151	781	444	2386060	276	713	7537	96	371	473
Row14	8.25 158	624	350	1302950	361	503	6077	78	257	313
Row15	8.28 164	564	285	555450	661	283	5069	61	179	206
Row16	8.31 171	524	317	276500	1312	727	5197	59	146	189
Row17	8.35 177	514	401	200242	2417	203	4684	58	138	170
Row18	8.38 184	469	556	1644947	3294	174	5073	57	124	160
Row19	8.41 190	501	655	166531	5573	175	5246	56	125	155
Row20	8.44 197	523	818	147730	6913	167	5189	55	123	158
Row21	8.48 205	528	1114	161354	9478	163	5783	57	118	156
Row22	8.51 221	606	1625	185197	16393	194	7642	64	124	158
Row23	8.54 239	864	2771	321720	28477	260	12031	85	137	181
Row24	8.57 256	1806	6486	732420	68050	475	22243	155	179	241
Row25	9.01 274	2601	12018	1285180	127500	741	37479	249	227	291
Row26	9.04 290	3702	17860	1499240	194370	931	48799	288	243	334
Row27	9.07 307	5364	23271	2168360	247090	1481	76610	416	374	445
Row28	9.11 324	6823	28626	6513700	381530	3223	107310	646	714	938
Row29	9.14 341	11054	41526	6823900	512110	5577	177120	1313	776	1005
Row30	9.18 358	12783	29977	2443450	347520	6215	162410	4998	534	605
Row31	9.21 375	12263	26141	811230	276510	19297	139830	15608	470	462
Row32	9.24 392	11758	29400	473331	316480	42726	144740	26264	461	437
Row33	9.28 409	13390	38577	400260	423910	71370	177730	41375	542	464
Row34	9.31 426	17649	52028	355380	533410	119060	210840	60529	712	548
Row35	9.35 443	21788	79941	321420	835630	187360	303860	84705	869	609
Row36	9.38 460	55562	160137	372620	1870200	324990	833820	118610	1350	948
Row37	9.42 478	116061	298020	387060	3215900	391720	1407500	69564	1177	1064
Row38	9.45 495	53193	145700	167287	1456900	314460	596250	13338	445	447
Row39	9.48 512	31044	72312	104199	672220	188750	336760	2867	230	253
Row40	9.52 529	26909	32085	67495	312920	87372	305230	1568	155	186
Row41	9.55 546	29962	17157	54998	162510	37590	389190	1719	132	142
Row42	9.59 563	26281	4721	44552	42666	7144	277900	1317	102	126
Row43	10.02 580	19512	2055	36795	19278	3374	225690	932	100	117
Row44	10.05 597	12721	1460	32463	12485	2340	158180	680	89	109
Row45	10.09 613	10501	1264	29982	9542	1608	124550	521	92	111
Row46	10.12 630	9013	1189	27607	8530	1005	92020	421	89	110
Row47	10.15 646	7739	1663	24976	7056	680	82376	343	92	121

Row50	10.25	670	7670	985	10811	3702	702	13070	510	527	731
Row51	10.28	712	7859	903	19453	3340	562	80590	335	741	1098
Row52	10.32	729	8590	957	10331	3146	905	77110	322	1942	2783
Row53	10.35	746	8260	900	18256	3437	1907	80690	374	5239	8131
Row54	10.38	763	10123	966	18474	3481	4643	82670	430	14204	22943
Row55	10.42	781	10926	930	22500	3673	9855	82210	504	33846	50303
Row56	10.45	798	12468	1074	28180	5334	19346	95104	651	67120	102500
Row57	10.49	817	14693	1282	32310	7632	32463	102910	812	110100	170200
Row58	10.52	835	19048	1592	41597	10345	47005	132380	1040	142060	212590
Row59	10.56	853	29351	2291	47952	18498	73960	191428	1584	216780	360840
Row60	10.59	870	47861	3783	65208	29237	126580	394968	2685	403990	648560
Row61	11.03	889	83194	5923	103640	53527	236750	711900	5406	761700	1134600
Row62	11.07	909	140360	7213	157175	41681	395820	1258780	8480	1296600	1796500
Row63	11.10	928	215218	8537	187227	26187	637430	1774800	12848	1963900	2540700
Row64	11.14	948	286811	11808	165355	28881	833310	2119500	14453	2284200	3265300
Row65	11.18	967	337674	14441	132870	30032	967240	2187600	16264	2464900	3320700
Row66	11.22	987	374264	17075	109396	32147	1093630	1867300	15495	2731700	3403000
Row67	11.25	1006	323774	15709	93917	25646	729120	899610	8646	1671600	2291100
Row68	11.29	1015	126407	4121	41191	7500	188680	218970	2707	409340	615990
Row69	11.33	1013	50989	1625	22082	2255	62210	103390	1006	134870	196100
Row70	11.37	1012	28432	918	15752	1445	31700	51408	552	74070	95950
Row71	11.40	1011	17125	653	14113	951	20011	32054	388	38032	57799
Row72	11.43	1011	14024	517	11836	699	14392	26343	269	29854	41775
Row73	11.47	1011	11206	451	11333	578	9657	22196	204	19757	31368
Row74	11.50	1011	9460	384	9794	459	7680	13853	168	15773	21105
Row75	11.54	1011	7144	321	8919	410	6484	9576	159	10246	18025
Row76	11.57	971	3834	215	7735	208	1854	4276	72	2779	5002
Row77	12.00	857	459	114	6331	111	296	1370	53	510	682

FILE NAME = MW3249
 NAME = V. Eschen
 = MWM3249
 TE = 8 Nov 1994
 MASSES = 9
 SCANS = 75

***** MAIN ARRAY *****

Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11
M/E12	M/E14	M/E18	M/E30	M/E32	M/E44	M/E46	M/E48	M/E64
189	136	3484	118	102	975	77	85	89
292	208	522560	144	164	1870	87	110	117
249	163	226270	134	137	1598	85	103	106
278	168	240773	135	132	2096	85	102	106
339	170	312202	143	139	2761	87	105	108
415	206	718460	167	187	4238	97	129	135
868	646	6362620	409	1065	11475	202	643	774
2856	252438480000	2481	10764	51488	1110	5255	6014	
2526	206227271000	1367	5297	29514	558	2150	2586	
1466	903	7022260	524	1283	14842	217	549	596
980	391	1257420	309	408	9001	129	194	213
776	313	585220	428	257	7363	112	138	147
716	320	374587	1013	206	6985	105	119	127
660	405	278870	1961	184	6663	102	110	117
662	523	251054	3794	174	6368	101	105	108
652	679	239550	5483	164	6627	100	102	109
669	932	233920	7545	163	6995	102	99	104
702	1194	223730	11316	168	7831	103	100	104
738	1489	228114	15441	178	8228	103	95	103
787	2118	272086	21975	202	10009	108	97	102
1069	3480	403222	39949	255	13805	121	101	105
1781	6933	852500	82170	444	26361	174	118	125
3485	15428	2025500	170210	853	48804	318	169	184
5159	27416	2552940	335430	1411	76010	469	216	251
6648	37455	2222270	402490	1651	90420	472	209	234
9841	47908	7674630	570230	3919	159350	870	521	612
12763	5532415243800	902680	6955	206600	1192	883	1119	
18417	61527	7366150	731650	7538	245900	3247	645	766
16597	38060	1805380	446180	18248	220740	14113	934	1256
16645	39734	870330	418420	48643	224550	33197	958	1034
17772	45977	705080	465570	91140	244600	52094	985	1085
19307	56651	592600	627850	155000	258850	81330	1115	1055
21603	71229	525330	873570	239230	256920	112810	1279	1152
24896	117850	478296	1292200	375510	339450	153080	1489	1230
39510	196560	446500	2439900	674370	564490	202030	2022	1441
58094	321033	402208	3804500	1265370	896930	213210	2408	1722
54229	359636	280890	4049600	1890500	808070	119610	1717	1490
31882	196048	150036	1937300	1033090	404230	15886	559	586
28148	49055	82384	441860	227250	372740	2105	196	218
29499	10769	63902	98130	43904	351030	1836	129	144
22462	4566	54457	43586	21987	260040	1159	115	128
14895	3211	52119	30101	17052	185070	855	110	121
11118	2678	49004	23364	15596	147010	649	107	120
9401	2312	46242	18840	12979	118210	551	107	115
8471	2035	43868	15351	10411	98090	457	105	117
7717	1793	42803	12671	8659	94890	439	106	118
7263	1573	43487	11133	7285	84350	420	107	124

FILE NAME = MW3249C
 CUSTOMER NAME = V. Eschen
 SAMPLE = MWM3249C
 SAMPLE DATE = 9 Nov 1994
 NUMBER OF MASSES = 9
 NUMBER OF SCANS = 75

***** MAIN ARRAY *****

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11
Row1	TIME	TEMP	M/E12	M/E14	M/E18	M/E30	M/E32	M/E44	M/E46	M/E48	M/E64
Row2	Backend =		175	135	1915	107	105	868	80	102	115
Row3	9.11	24	233	170	293430	124	139	1296	86	117	130
Row4	9.14	54	214	152	141800	117	122	1173	84	110	122
Row5	9.17	82	215	151	146415	123	121	1361	83	110	124
Row6	9.20	106	253	158	187080	144	121	1818	81	108	122
Row7	9.24	112	316	172	322160	209	145	2648	82	110	125
Row8	9.27	117	503	308	1882810	346	350	5097	102	180	242
Row9	9.30	122	2541	198531	247000	2129	7674	51216	937	3234	4190
Row10	9.34	130	2762	208527	825000	1720	5481	36329	622	1965	2766
Row11	9.37	136	1930	120112	256900	673	2127	19541	287	952	998
Row12	9.40	143	1289	708	5094830	437	982	13514	178	417	507
Row13	9.44	150	903	432	1712800	355	448	9383	119	208	251
Row14	9.47	156	800	329	532110	616	267	7258	99	142	163
Row15	9.50	162	705	374	342490	1494	225	7542	95	123	144
Row16	9.53	169	690	498	257980	2842	209	7020	91	117	139
Row17	9.57	175	683	641	235310	4751	191	6753	89	110	130
Row18	10.00	182	724	835	215730	7031	189	7211	89	108	129
Row19	10.03	188	715	1147	202140	9956	177	7454	90	107	125
Row20	10.06	195	763	1489	226680	13111	188	8179	91	106	123
Row21	10.10	202	848	1898	241630	18649	193	9229	95	105	121
Row22	10.13	217	931	2747	330550	28974	228	11422	103	107	130
Row23	10.16	235	1422	5116	623960	54262	325	20081	149	121	147
Row24	10.19	252	2661	10348	1396140	122580	627	38522	283	159	196
Row25	10.23	268	4263	19846	2087050	236130	1021	62870	457	204	251
Row26	10.26	286	6295	28948	2227340	327970	1259	84130	550	213	257
Row27	10.30	302	10063	38460	4868370	470660	2544	165470	910	396	509
Row28	10.33	319	13040	476091	3597100	663900	5856	216990	1310	871	1070
Row29	10.36	337	18791	668341	2401000	935210	7337	270320	3106	800	1054
Row30	10.40	355	19218	46818	4515950	529350	9618	254880	8333	624	727
Row31	10.43	371	17381	42430	1143220	443740	27305	207930	21313	528	521
Row32	10.47	389	21044	45904	793260	485270	59686	246930	36619	568	506
Row33	10.50	406	24271	60155	694710	661480	109830	285640	55394	718	598
Row34	10.54	423	28768	85019	609860	895760	175110	392020	80420	880	688
Row35	10.57	440	47937	148938	632960	1842300	290370	686710	113080	1133	916
Row36	11.01	457	144234	403400	923250	5560800	519850	2407200	162010	1900	1675
Row37	11.04	475	134987	410740	549200	4254900	499750	1669900	44419	916	822
Row38	11.08	493	67638	155854	234070	1490800	325840	798020	8768	386	398
Row39	11.11	510	45907	65851	138740	685690	178030	542370	3403	198	226
Row40	11.14	527	47387	37747	98738	374710	95890	601250	2982	152	181
Row41	11.18	544	50876	11928	81990	114070	17860	611380	2622	123	140
Row42	11.21	562	44375	4546	61735	44440	5709	494360	2062	108	120
Row43	11.25	578	30982	2697	52038	23657	3379	377420	1505	102	117
Row44	11.28	595	22970	2182	50444	18282	2426	255750	1026	98	109
Row45	11.31	611	16559	1974	46502	14897	1638	189540	787	95	111
Row46	11.35	628	14989	1840	45083	13949	1088	151990	684	100	113
Row47	11.38	645	13236	1793	44279	11859	850	142750	642	101	117

Row50	11.48	695	12208	1542	44289	7378	612	124810	563	208	290
Row51	11.51	711	13117	1631	46477	7491	743	118970	561	469	665
Row52	11.55	725	12902	1671	45551	6200	1109	117450	516	1351	1965
Row53	11.58	741	12838	1742	44694	6624	2190	114110	515	4511	7309
Row54	12.01	756	13520	1860	42778	8574	5035	117490	568	15325	22886
Row55	12.05	771	15115	1828	40789	9832	12332	114610	623	37927	56511
Row56	12.08	787	16160	1982	44280	11423	22849	116170	704	67890	105260
Row57	12.12	803	20826	2402	43302	17755	35089	118550	959	105840	165160
Row58	12.15	819	24514	3007	46017	23401	52897	140340	1224	150290	253030
Row59	12.19	835	34392	3973	53648	31474	77000	173790	1645	229300	362240
Row60	12.22	851	45192	2859	69179	14851	109410	201030	1943	333950	533710
Row61	12.26	867	58693	3254	82630	15141	141470	272030	2481	434070	684550
Row62	12.29	884	75157	3626	79608	15860	183810	325440	3272	602810	852300
Row63	12.33	901	99351	4364	79260	15748	259550	421630	4136	783420	1157250
Row64	12.37	918	143031	5793	90340	19431	409360	649570	5524	1115000	1779400
Row65	12.40	935	203483	8748	95460	26860	604940	1033790	8745	1773100	2483000
Row66	12.44	952	297783	13035	112900	32349	841120	1868200	13016	2450900	3390300
Row67	12.48	969	555530	20636	172095	44989	1209350	4976800	32765	3527300	5018600
Row68	12.52	979	1000500	27986	606050	40275	1203000	7617800	49350	3203500	4458500
Row69	12.56	978	799410	25231	283280	32810	820360	5801600	39531	1754200	2840000
Row70	13.00	977	433170	12998	130740	13020	441910	2860200	19042	849660	629520
Row71	13.04	976	192013	3843	52320	6369	269230	1138760	11042	431170	752290
Row72	13.08	976	126884	2617	33747	5093	151750	714620	4722	245290	361390
Row73	13.11	976	93308	2256	27315	2929	37482	610190	4723	227330	229340
Row74	13.15	975	60796	1248	18071	1589	53525	366570	2498	78611	121850
Row75	13.19	976	43443	895	16788	1143	33420	249400	1585	52193	121105
Row76	13.22	859	4094	253	9464	259	5301	27338	200	9797	12574
Row77	13.26	774	491	176	5985	172	837	2604	84	1039	2125

FILE NAME = MW3110
 CUSTOMER NAME = V. Eschen
 SAMPLE = MWM3110
 SAMPLE DATE = 10 Nov 1994
 NUMBER OF MASSES = 9
 NUMBER OF SCANS = 75

***** MAIN ARRAY *****

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11
Row1	TIME	TEMP	M/E12	M/E14	M/E18	M/E30	M/E32	M/E44	M/E46	M/E48	M/E64
Row2	Backgnd	=	165	125	2692	100	104	873	78	96	111
Row3	7.44	23	228	162	326540	116	163	1344	82	120	137
Row4	7.47	40	192	133	127919	105	128	1168	75	104	116
Row5	7.50	72	191	131	123855	102	121	1206	75	103	118
Row6	7.53	96	217	139	192205	110	132	1703	76	106	120
Row7	7.56	112	284	147	293730	117	151	2321	78	119	128
Row8	8.00	114	477	237	1463490	159	367	5489	102	250	272
Row9	8.03	119	2764	115016711300	924	4884	80650	863	3865	5508	
Row10	8.06	126	4679	191428138000	1538	9440	84334	886	4547	5169	
Row11	8.10	133	3839	125714011500	691	3077	61167	498	1576	2001	
Row12	8.13	140	3331	776 6871970	435	1678	41093	311	794	950	
Row13	8.17	147	2261	558 3617860	366	946	28502	220	490	552	
Row14	8.20	153	1841	373 1597690	452	518	19833	157	266	314	
Row15	8.23	160	1019	311 616740	945	278	11079	110	171	193	
Row16	8.26	166	715	387 342607	2205	217	7082	95	136	155	
Row17	8.30	173	557	536 278147	3920	195	6869	92	124	142	
Row18	8.33	179	627	682 227350	5995	179	6695	93	119	134	
Row19	8.36	186	636	910 220324	7887	176	7164	92	112	131	
Row20	8.39	192	682	1289 221060	11681	187	7470	90	112	124	
Row21	8.43	199	735	1521 226540	15554	191	7775	93	110	122	
Row22	8.46	209	812	2139 259340	23436	207	9780	98	111	122	
Row23	8.49	227	1154	3735 459530	42038	293	14039	119	121	139	
Row24	8.52	244	2205	7677 1056460	93750	524	29224	199	163	193	
Row25	8.56	261	3427	15565 1735960	193070	932	51082	321	229	273	
Row26	8.59	278	5084	26412 2391240	315350	1395	70847	424	301	338	
Row27	9.02	295	5965	33630 2387800	412000	1821	89080	528	341	384	
Row28	9.06	312	8812	41866 9083800	545710	3915	137680	822	886	1103	
Row29	9.09	329	12237	5554810416500	720480	6239	176250	1241	1001	1164	
Row30	9.13	347	14030	41818 3875210	486610	6269	191860	2904	612	726	
Row31	9.16	363	13383	31162 1226550	355550	18277	177970	13114	747	1001	
Row32	9.20	380	15310	33642 719590	344490	45917	201560	27558	930	1218	
Row33	9.23	397	15189	39597 578270	423170	79850	200990	45844	1253	1387	
Row34	9.26	414	15707	49831 474250	540630	131050	216250	68353	1405	1546	
Row35	9.30	432	16876	64420 419150	782210	216340	244040	92440	1579	1485	
Row36	9.33	449	21241	100264 385692	1165870	343410	275180	129130	1749	1626	
Row37	9.37	466	28652	165603 347390	1934800	631150	408110	181340	2429	1956	
Row38	9.40	484	45349	280074 306920	3367400	1388670	638980	209780	3318	2746	
Row39	9.44	501	40643	350585 225573	3928600	1944700	567660	99310	2365	2083	
Row40	9.47	518	20710	98107 98449	862400	472580	253750	4028	417	445	
Row41	9.51	535	24532	17847 64432	159730	83920	383950	1575	188	285	
Row42	9.54	552	28621	6004 51745	55284	29929	251500	1176	139	156	
Row43	9.57	569	13228	3291 43878	31413	19884	147540	717	120	138	
Row44	10.01	586	9815	2621 38637	24479	16581	123700	523	115	135	
Row45	10.04	602	8129	2178 34751	18349	15519	103270	473	111	134	
Row46	10.07	619	7292	2056 33908	17787	13331	93700	408	109	126	
Row47	10.11	635	6599	1840 31401	14266	11075	80740	398	106	125	

Row50	10.20	685	5022	1560	23694	9948	6769	60214	296	109	129
Row51	10.24	701	5261	1637	20595	9241	7606	60098	286	117	142
Row52	10.27	718	5229	1695	18918	9126	8368	59703	281	146	194
Row53	10.30	735	5089	1773	16335	9633	9724	60130	282	267	384
Row54	10.34	752	5527	1788	14588	8176	9528	61490	282	702	1039
Row55	10.37	769	4969	1520	12612	6813	9311	55897	266	2114	2956
Row56	10.40	786	4065	1462	13261	5284	9816	46689	228	5609	8565
Row57	10.44	804	2997	1394	14018	6854	13355	29991	218	14522	21405
Row58	10.47	821	2953	1475	16313	7842	21374	31130	244	28420	46208
Row59	10.50	838	3190	1640	16811	11845	37072	20386	329	53499	77430
Row60	10.54	856	3545	2008	18167	15887	67720	22853	473	94190	141980
Row61	10.57	874	6010	2765	18882	25569	126080	33375	724	157390	223860
Row62	11.01	891	8611	3818	21751	39495	219080	46886	1217	294760	416590
Row63	11.04	909	20558	8385	24798	95984	461630	126600	2946	581780	862180
Row64	11.08	928	51845	27982	46930	266260	978230	403320	7779	1179400	1689400
Row65	11.11	946	70288	3562	27943	18332	1586800	683090	7171	1716200	2767400
Row66	11.15	965	37997	2878	24387	14568	2152500	505360	5393	2209900	2937500
Row67	11.19	984	27143	3090	30258	16625	3283100	157650	5887	2918700	3918700
Row68	11.22	1003	14789	2933	40647	17867	4803900	118750	6483	4091400	5022200
Row69	11.26	1015	14771	2736	41591	13833	4464100	101091	5640	3517700	4512000
Row70	11.30	1014	3150	1801	28794	8133	2696900	31947	4251	2157400	2916300
Row71	11.33	1013	2153	1427	26216	5436	1755200	22814	3157	1423600	1934100
Row72	11.37	1012	1729	1052	25088	3787	1238950	15858	2402	981970	1295800
Row73	11.40	1011	1421	874	20591	2881	838240	11883	1815	669950	909290
Row74	11.44	1011	1052	707	17535	2098	584560	7953	1283	426810	572030
Row75	11.47	1010	819	582	14209	1637	390800	6100	896	281660	355150
Row76	11.51	1010	688	477	11003	1294	272310	4757	668	179450	267700
Row77	11.54	998	495	373	9284	821	113550	2936	324	71410	88060

FILE NAME = MW3110C
 CUSTOMER NAME = V. Eschen
 SAMPLE = MWM3110C
 SAMPLE DATE = 11 Nov 1994
 NUMBER OF MASSES = 9
 NUMBER OF SCANS = 75

***** MAIN ARRAY *****

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11
Row1	TIME	TEMP	M/E12	M/E14	M/E18	M/E30	M/E32	M/E44	M/E46	M/E48	M/E64
Row2	Backand	=	188	130	2175	84	78	996	48	81	99
Row3	6.48	23	281	7816	374010	157	13609	1621	50	121	146
Row4	6.52	50	229	3696	142985	124	6149	1283	46	101	120
Row5	6.55	79	228	1727	124655	126	3165	1468	47	93	119
Row6	6.58	103	242	843	171333	165	1679	1916	46	97	119
Row7	7.01	112	305	503	204607	255	796	2406	50	103	126
Row8	7.05	116	387	358	566340	380	545	3589	64	139	180
Row9	7.08	122	1508	659	5130410	773	1624	29935	294	850	1305
Row10	7.11	128	4288	180629414000	2244	9054	81792	940	4609	5803	
Row11	7.15	135	3546	145717660300	1098	4422	49528	519	1856	2353	
Row12	7.18	142	3357	783	6435920	562	1460	41242	313	654	786
Row13	7.21	149	2551	410	1580580	327	501	28417	184	257	302
Row14	7.25	155	1475	292	494710	398	285	15036	114	158	195
Row15	7.28	162	716	295	301623	808	230	6865	77	127	161
Row16	7.31	168	662	360	230940	1620	208	6604	73	114	142
Row17	7.34	175	632	462	212049	2911	183	6633	71	106	132
Row18	7.38	181	681	608	189670	4543	182	6819	76	108	130
Row19	7.41	188	685	759	180543	6150	178	7428	75	102	123
Row20	7.44	194	710	999	175048	8957	166	7480	77	102	124
Row21	7.47	201	716	1231	178700	12350	169	8636	79	102	123
Row22	7.51	214	879	1698	214450	18016	188	10485	82	100	128
Row23	7.54	232	1131	2902	323171	32619	251	15461	109	114	142
Row24	7.57	249	2002	5655	729060	61290	432	27597	172	143	183
Row25	8.00	256	3339	12482	1560020	140900	740	47275	275	208	250
Row26	8.04	283	5083	20601	1894500	253750	1104	65135	394	246	310
Row27	8.07	300	5399	26664	1666150	307180	1233	72800	417	237	296
Row28	8.11	317	8699	34796	6519400	435100	2934	138620	738	635	767
Row29	8.14	334	11536	4762310766200	635960	5832	189950	1129	931	1130	
Row30	8.17	351	13781	42395	4665180	505280	5056	197840	1503	516	618
Row31	8.21	368	13032	32757	1146420	344200	9793	168200	5158	438	538
Row32	8.24	385	16250	35211	683670	368460	29003	188970	14189	501	558
Row33	8.28	402	17505	41964	540430	448660	58108	227200	29419	610	669
Row34	8.31	419	21074	57153	521480	585870	99940	277330	47116	800	765
Row35	8.34	436	27862	80165	489400	869590	166120	362260	64917	957	901
Row36	8.38	454	50006	152555	491260	1913400	270510	807470	100050	1342	1192
Row37	8.41	471	139742	420757	651080	4996200	440520	2182300	110080	1998	2000
Row38	8.45	489	92628	277208	312950	2833800	392630	1137760	23960	863	812
Row39	8.48	506	50611	108909	142222	1106680	250250	596310	5233	317	366
Row40	8.52	524	36064	44381	77936	423490	109830	437140	2245	183	211
Row41	8.55	541	41508	16697	60206	144360	36004	515830	2270	128	155
Row42	8.59	558	43563	5259	52617	51632	8747	536920	2279	116	138
Row43	9.02	575	36483	2651	45622	23228	4140	442080	2022	104	127
Row44	9.05	592	26053	1951	38705	15802	2615	312880	1347	92	116
Row45	9.09	609	17476	1622	31718	13063	1801	213350	908	92	113
Row46	9.12	625	14320	1516	32060	11886	1284	153960	695	95	110
Row47	9.15	642	13277	1377	30398	9724	858	138080	587	93	119

Row50	9.28	892	11271	1232	21103	3333	333	123710	300	173	270
Row51	9.29	709	10579	1244	21676	4639	667	117980	522	327	452
Row52	9.32	725	11155	1249	18198	4268	994	110620	456	805	1171
Row53	9.35	743	11766	1178	18823	3782	1535	102170	461	2252	3733
Row54	9.39	760	12267	1146	18379	3790	2657	110450	509	7473	10949
Row55	9.42	777	12143	1089	20509	3561	6505	112040	513	19428	32623
Row56	9.46	795	14852	1280	26029	5056	15636	114230	616	53471	76770
Row57	9.49	813	18756	1448	37623	6706	34063	140570	911	110320	176850
Row58	9.52	831	26122	1677	56798	7065	54053	199520	1350	174780	287950
Row59	9.56	849	35174	1954	74454	9966	80590	260530	1882	278450	396270
Row60	10.00	867	51389	2531	92009	11433	112680	346930	2383	363060	550120
Row61	10.03	886	72080	3289	118783	16974	172720	511510	3627	541280	808200
Row62	10.07	905	124543	4823	144384	28559	329300	1019990	7335	1129900	1720000
Row63	10.10	924	273468	11213	304320	53081	655270	2644200	16620	2424200	3434700
Row64	10.14	943	512533	18800	363500	62095	1210700	5356900	33855	3889600	5086900
Row65	10.18	964	725320	21632	207590	52947	1272500	4984500	33839	3764900	4729300
Row66	10.22	984	465312	20781	132680	45426	853830	2625600	19946	2850200	3692200
Row67	10.26	1004	410276	18044	115410	36028	730680	1854200	15563	1992900	2765600
Row68	10.30	1015	207690	6955	54273	11683	203040	669740	4644	462900	591260
Row69	10.34	1014	99504	2658	28927	3890	47166	385070	2223	89080	130230
Row70	10.37	1012	82631	2122	21834	2849	15762	274370	1207	25462	34752
Row71	10.41	1012	70073	1708	17118	1919	9249	194120	989	11650	16269
Row72	10.44	1011	46806	1430	14419	1718	5577	156010	914	4522	5073
Row73	10.48	1011	43494	1219	12492	1189	4039	125260	616	2007	3420
Row74	10.51	1011	35534	1009	11211	933	3012	101960	461	962	1704
Row75	10.55	1011	29472	895	9519	822	2237	80060	467	709	1275
Row76	10.58	981	27295	604	8144	545	1283	46796	247	290	496
Row77	11.01	862	2182	195	5215	177	328	8359	87	184	313

FILE NAME = MW3270
CUSTOMER NAME = V. Eschen
SAMPLE = MWM3270
SAMPLE DATE = 14 Nov 1994
NUMBER OF MASSES = 9
NUMBER OF SCANS = 75

***** MAIN ARRAY *****

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11
Row1	TIME	TEMP	M/E12	M/E14	M/E18	M/E30	M/E32	M/E44	M/E46	M/E49	M/E64
Row2	Backgnd	=	44	38	1218	32	32	145	29	33	32
Row3	10.05	27	57	3533	176060	46	6809	245	33	39	40
Row4	10.08	47	50	1560	115482	38	3364	208	27	31	33
Row5	10.11	71	50	790	106286	37	1735	205	32	36	37
Row6	10.14	95	55	408	189020	41	805	224	32	39	39
Row7	10.18	111	57	223	315280	38	392	255	32	40	41
Row8	10.21	114	58	130	300806	38	197	275	33	41	39
Row9	10.24	119	59	90	259990	38	108	263	31	40	40
Row10	10.27	125	60	75	268620	41	72	280	32	38	41
Row11	10.30	131	61	66	250070	43	55	348	32	38	39
Row12	10.34	138	68	65	255110	55	51	420	31	37	39
Row13	10.37	144	74	68	282600	78	48	514	34	39	40
Row14	10.40	150	82	73	247670	139	47	605	33	42	38
Row15	10.43	157	89	82	245350	305	48	747	32	40	39
Row16	10.46	163	104	107	239690	605	47	907	33	35	38
Row17	10.49	170	119	158	237380	1093	49	1102	35	38	39
Row18	10.53	176	133	228	233420	2121	47	1345	33	36	39
Row19	10.56	182	154	343	211000	3513	50	1558	33	36	38
Row20	10.59	189	173	487	225730	4789	54	1970	33	39	40
Row21	11.02	195	196	654	227160	7150	58	2150	32	36	38
Row22	11.05	202	219	903	203670	9105	58	2827	34	36	36
Row23	11.09	217	288	1261	256740	14429	76	3748	36	38	40
Row24	11.12	234	467	2224	427290	27834	112	6043	47	43	45
Row25	11.15	251	897	4774	772720	54103	214	13131	77	55	59
Row26	11.18	268	1918	9371	1471450	120020	425	27909	142	75	82
Row27	11.22	285	3137	17829	1989320	219460	784	47314	225	93	102
Row28	11.25	302	4001	24690	1746370	299210	893	57370	263	86	96
Row29	11.28	318	6598	31580	5228020	439700	1964	93240	450	223	265
Row30	11.32	335	7931	4164810	760600	647560	4005	124690	609	431	538
Row31	11.35	353	11864	44889	5131600	529340	4419	147130	754	246	297
Row32	11.39	369	11300	27147	1284980	306000	10977	147270	2327	334	457
Row33	11.42	386	11987	27156	678940	307870	31020	156640	11221	523	684
Row34	11.45	403	13210	30820	636830	357690	56603	177330	23868	724	788
Row35	11.49	420	13225	37646	552860	415110	91470	182130	37658	891	928
Row36	11.52	437	13628	49334	497190	546490	160830	179370	57799	1014	1024
Row37	11.56	455	15606	71773	393930	806230	250060	190560	78910	1215	1156
Row38	11.59	472	17925	100105	368569	1168000	414590	235360	103290	1384	1221
Row39	12.03	489	24535	168645	323310	1971400	736300	349920	129760	1696	1434
Row40	12.06	507	30541	252705	340040	2911100	1273560	452580	113370	1685	1586
Row41	12.10	524	21778	198161	254920	2111500	1066910	265930	27551	836	781
Row42	12.13	541	14778	50914	149810	447260	227470	184020	1704	187	210
Row43	12.16	558	16617	8479	123226	78040	35452	221470	1025	94	111
Row44	12.20	575	14048	3916	111328	35933	16400	174040	762	72	89
Row45	12.23	592	10996	2985	90779	29667	13892	127040	596	64	77
Row46	12.27	609	8664	2791	85311	26940	13461	102550	461	60	72
Row47	12.30	626	6581	2712	89783	23955	12849	70510	361	57	74

Row50	12.40	575	4615	1875	55289	14615	8170	51121	210	79	106
Row51	12.43	692	4190	1709	61478	11976	8430	48289	219	114	154
Row52	12.46	708	3926	1686	55192	10149	8855	43259	209	162	227
Row53	12.50	725	3826	1479	46917	8472	9710	45042	203	274	385
Row54	12.53	742	3490	1443	42016	7594	9157	44613	206	600	858
Row55	12.56	759	3928	1335	39529	6983	8682	44671	208	1587	2247
Row56	12.59	776	3241	1266	32891	6604	8892	35654	186	4439	7101
Row57	13.03	793	2954	1288	30850	7332	10815	27956	197	13927	21135
Row58	13.06	811	1866	1283	28330	8475	17527	19350	229	32403	48769
Row59	13.09	828	1920	1724	27074	12051	27420	20797	336	50385	74150
Row60	13.13	845	3208	3260	22539	26415	35263	29008	625	66080	93170
Row61	13.16	863	6181	7103	26758	69990	49430	53169	2752	77040	113920
Row62	13.20	881	6389	1609	8702	10724	60631	55952	759	96850	159870
Row63	13.23	899	6523	980	6479	5557	76840	54600	756	113530	179410
Row64	13.27	917	7004	875	10272	4399	115940	51144	871	168910	226340
Row65	13.30	935	7319	1046	14664	4822	171010	49925	1213	238330	302610
Row66	13.34	954	6738	1233	22715	5324	262220	32665	1665	361050	427130
Row67	13.38	972	4607	1523	26640	4824	404770	22147	2123	510380	567160
Row68	13.41	991	2739	1146	29920	4949	567390	18894	2498	761020	815500
Row69	13.45	1010	1683	1124	27980	4528	709220	13260	2472	763370	879220
Row70	13.49	1015	1018	846	19738	3180	530230	8897	1735	557430	666620
Row71	13.52	1013	617	579	14349	2121	354510	4367	1202	345890	437480
Row72	13.56	1012	469	441	11456	1541	272020	3103	941	235070	296270
Row73	13.59	1011	395	366	8658	1085	183350	2341	690	156950	219560
Row74	14.03	1011	380	358	11691	953	146000	2423	613	125070	168070
Row75	14.06	1011	307	252	11359	692	116160	1733	454	93920	147120
Row76	14.10	1010	254	232	10454	575	87950	1584	345	64390	89040
Row77	14.13	1010	197	193	10513	422	55538	1145	255	48542	59731

FILE NAME = MW3270C
 CUSTOMER NAME = V. Eschen
 SAMPLE = MWM3270C
 SAMPLE DATE = 15 Nov 1994
 NUMBER OF MASSES = 9
 NUMBER OF SCANS = 75

***** MAIN ARRAY *****

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11
Row1	TIME	TEMP	M/E12	M/E14	M/E18	M/E30	M/E32	M/E44	M/E46	M/E48	M/E64
Row2	Backgnd	=	75	62	1063	53	93	360	35	248	327
Row3	9.14	23	103	2354	263360	70	3892	553	37	295	372
Row4	9.17	43	87	1556	73305	62	2707	514	33	269	347
Row5	9.21	74	92	1040	78920	64	2109	592	36	253	348
Row6	9.24	98	123	697	161090	95	1388	955	37	282	359
Row7	9.27	112	197	564	353990	185	1006	1943	40	319	422
Row8	9.30	115	449	689	3635390	436	1506	5810	94	1046	1466
Row9	9.34	120	1428	147124169000	1374	8358	25040	548	6073	8942	
Row10	9.37	127	1151	101110823400	605	2723	12494	197	2136	2917	
Row11	9.40	134	778	540	4096930	290	1082	7716	100	876	1172
Row12	9.44	140	565	287	1265370	229	541	5709	67	520	681
Row13	9.47	147	451	202	491073	330	338	4454	55	363	487
Row14	9.50	153	414	206	260790	697	243	4067	48	306	416
Row15	9.53	160	400	244	175870	1422	213	3802	48	278	374
Row16	9.57	166	403	334	158135	2226	196	4143	48	259	354
Row17	10.00	173	414	441	137810	3310	179	4314	47	260	343
Row18	10.03	179	409	574	134611	4852	173	4385	46	244	329
Row19	10.06	186	411	721	134657	6562	165	4428	48	237	322
Row20	10.10	192	448	946	141214	9183	168	5382	51	246	332
Row21	10.13	199	485	1118	160740	12186	166	5651	52	234	318
Row22	10.16	209	583	1656	205490	16739	186	6802	58	252	333
Row23	10.19	227	904	2851	372930	31115	265	10761	85	277	364
Row24	10.22	244	1665	6879	917290	69050	465	22078	163	370	492
Row25	10.26	261	2701	12076	1303580	138600	703	37066	281	439	565
Row26	10.29	278	3800	18078	1404160	196070	916	50507	337	443	575
Row27	10.32	295	6607	22289	2378730	257680	1521	89096	524	647	847
Row28	10.36	311	7064	27598	8381100	368600	3635	113520	755	1447	2022
Row29	10.39	329	10220	40106	8694200	515030	4852	147940	1331	1427	1809
Row30	10.43	346	10513	28471	2927800	314850	4438	129540	2590	689	847
Row31	10.46	363	9088	23308	677960	249350	12067	114990	8106	527	606
Row32	10.49	380	11178	26220	514580	271150	30080	126100	16825	524	567
Row33	10.53	397	11929	30701	413470	321580	51862	155410	25691	570	573
Row34	10.56	414	14989	41498	378980	432190	80700	178630	40279	646	596
Row35	11.00	431	19173	60930	354610	631180	134520	227870	53483	745	681
Row36	11.03	448	37139	114302	364520	1299200	212480	547680	82471	1198	991
Row37	11.07	466	106586	290740	481400	3244700	391720	1347200	99750	1619	1458
Row38	11.10	484	77339	218760	267270	2187700	396100	876510	27897	891	864
Row39	11.14	502	41066	102193	134090	1018280	270140	427310	5981	450	474
Row40	11.17	519	25838	36404	76855	316570	105510	296250	1617	249	277
Row41	11.20	535	26625	10381	57119	98680	24714	308550	1382	189	227
Row42	11.24	552	25828	3922	50487	38654	7530	290740	1354	182	216
Row43	11.27	569	22366	2194	45064	18881	3310	269790	1103	175	217
Row44	11.30	586	16820	1693	41515	14141	2154	194580	750	172	213
Row45	11.34	602	12849	1475	37213	11756	1549	135580	582	164	210
Row46	11.37	619	9520	1312	36835	9944	1189	111480	476	165	212
Row47	11.40	636	8797	1219	34547	7866	894	99470	439	185	242

Row50	11.50	885	7538	1084	21135	4595	1021	73938	327	739	1001
Row51	11.54	702	7375	1041	21135	4595	1021	73938	327	739	1001
Row52	11.57	718	8167	1026	18735	4294	1450	74680	333	1856	2811
Row53	12.00	736	9141	1093	18092	5292	2254	82000	385	6089	9021
Row54	12.04	753	11173	1224	19735	6547	5834	107210	498	19445	31447
Row55	12.07	771	14599	1470	24553	9049	15538	129980	741	53779	80010
Row56	12.10	789	19686	1854	30856	11937	30504	182100	1098	104150	152560
Row57	12.14	807	30745	2384	38733	15692	50095	281430	1658	174260	251190
Row58	12.17	825	45582	2941	52779	21739	85800	428110	2713	281480	458410
Row59	12.21	843	110412	4391	144460	30319	275910	1538500	10292	1134300	1758700
Row60	12.25	862	290191	7996	336980	39347	665740	3546300	20173	2473200	3330700
Row61	12.29	882	319590	8757	214830	35542	790860	3788400	22361	2805600	3614500
Row62	12.32	902	358150	9207	139895	27231	755840	4099500	23497	2494400	3330700
Row63	12.36	921	236973	5957	71640	21426	485320	3201000	18782	1585100	2280000
Row64	12.40	941	131683	3766	60533	9630	180620	1493000	7619	810570	975490
Row65	12.44	960	117294	3323	46945	8428	104430	727130	5157	324430	619130
Row66	12.47	979	107660	3292	29157	7975	110320	598410	4930	385230	528640
Row67	12.51	999	93375	2967	27331	6476	128710	582390	4500	444920	491790
Row68	12.55	1014	61321	2040	25702	3721	95542	242400	1855	162700	249670
Row69	12.58	1014	39337	1142	19579	1555	27548	87230	816	65750	110370
Row70	13.02	1013	20874	665	13051	870	13319	52390	520	49787	51034
Row71	13.05	1012	13294	534	10772	586	7334	28172	234	15257	13900
Row72	13.09	1011	11769	435	9665	492	6303	21581	157	8661	7228
Row73	13.12	1011	9659	363	8720	394	3026	19067	147	6024	9172
Row74	13.16	1011	8140	352	8522	349	2747	15912	128	6199	9858
Row75	13.19	1010	6978	291	6894	314	2035	13521	116	3824	4149
Row76	13.22	1011	6872	269	6331	280	1505	12798	114	5797	6534
Row77	13.25	919	1321	122	5219	110	382	3737	49	558	953

FILE NAME = MW3225
 CUSTOMER NAME = V. Eschen
 SAMPLE = MW3225
 SAMPLE DATE = 7 Dec 1994
 NUMBER OF MASSES = 9
 NUMBER OF SCANS = 75

***** MAIN ARRAY *****

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11
Row1	TIME	TEMP	M/E12	M/E14	M/E18	M/E30	M/E32	M/E44	M/E46	M/E48	M/E54
Row2	Backgnd	=	105	91	1498	62	82	464	39	162	213
Row3	8.72	23	153	9419	176060	109	19679	715	45	203	250
Row4	8.26	47	140	8715	105820	104	17999	686	43	180	241
Row5	8.29	77	132	9242	108980	106	17798	746	44	187	234
Row6	8.32	102	156	9927	236250	164	18174	1000	64	200	247
Row7	8.36	112	204	9894	587530	460	20158	2213	285	252	337
Row8	8.39	115	295	9880	935120	951	20938	3593	569	318	401
Row9	8.42	122	334	9695	1370030	830	21373	3609	479	401	536
Row10	8.46	128	1403	1577820813000	2673	65630	31091	1414	3795	5216	
Row11	8.49	135	1434	1752216466480	1511	60113	20267	617	2399	3038	
Row12	8.53	142	1013	16196	8788000	745	40144	10360	299	1115	1512
Row13	8.56	149	782	13121	3791360	466	27032	6780	170	582	757
Row14	8.59	156	601	11524	1766110	474	21686	5270	119	385	466
Row15	9.03	162	520	10801	675430	761	19825	4923	92	232	307
Row16	9.06	169	495	9954	416390	1329	18522	4406	88	206	271
Row17	9.09	176	439	9621	337880	2284	19225	4435	94	191	245
Row18	9.13	182	457	9989	296570	3069	18538	3968	101	188	257
Row19	9.16	189	455	9710	285595	4395	19041	4653	111	183	230
Row20	9.19	196	478	9851	285480	5978	17856	4571	109	173	240
Row21	9.23	203	477	10361	263370	7482	18131	4977	113	164	219
Row22	9.26	220	528	10938	308275	12255	17934	6086	132	171	224
Row23	9.29	237	681	11028	451600	22039	18871	8412	180	188	262
Row24	9.33	255	1281	14283	814710	46835	20864	16567	279	251	300
Row25	9.36	272	2059	18789	1462060	87700	22360	31278	577	329	401
Row26	9.39	289	3668	23792	2018940	138820	24570	50219	1377	377	446
Row27	9.43	306	5229	25845	1741950	170690	23022	79020	2510	391	456
Row28	9.46	323	10933	36324	6141200	269580	35013	154220	6166	856	1140
Row29	9.50	340	18141	50136	9544800	471470	42885	257630	18596	1480	1744
Row30	9.53	358	14896	45147	4519500	333080	34870	182020	24590	843	886
Row31	9.57	375	10093	38260	861360	288460	33259	112440	28694	555	503
Row32	10.00	392	9198	39661	609470	288770	47207	106390	34912	526	433
Row33	10.03	409	9348	38736	514179	386430	56919	121090	44684	564	400
Row34	10.07	426	10748	41405	409521	381020	72730	133140	55615	561	416
Row35	10.10	443	10773	48466	370749	406670	99460	150540	76080	697	440
Row36	10.14	460	16514	65542	312460	592590	158490	188230	108690	898	533
Row37	10.17	477	20595	98671	308809	942520	300460	283430	144970	1291	629
Row38	10.21	495	22527	145888	265810	1541600	609820	298820	199830	1495	899
Row39	10.24	512	17872	195471	221780	1880700	931730	240620	151580	1434	892
Row40	10.28	530	10769	131237	138365	1208890	688870	115500	37056	533	438
Row41	10.31	547	6800	38266	80236	263160	147580	81820	2397	164	184
Row42	10.35	564	7102	12605	55808	46932	35417	74060	556	108	130
Row43	10.38	581	5295	9508	47044	25477	25135	57173	395	97	114
Row44	10.41	597	4230	8949	44611	20917	24018	44484	314	92	113
Row45	10.45	614	3492	9258	36305	18317	25437	40366	250	89	111
Row46	10.48	630	2637	9166	34945	17612	25600	32430	196	90	110
Row47	10.51	647	2433	9129	30469	15597	25120	28925	187	91	112

Row50	11.01	636	611	5106	6033	2137	6333	6133	112	191	133
Row51	11.04	713	2146	7592	21348	7716	25298	23361	145	158	209
Row52	11.08	730	2233	8211	20140	5781	26232	25939	142	317	435
Row53	11.11	747	2555	8196	19158	5985	24430	27028	157	761	1162
Row54	11.14	764	2673	9111	17507	6320	25353	30112	191	2289	3129
Row55	11.18	782	2830	8609	16156	7120	25490	27638	221	5790	8646
Row56	11.21	799	1782	7927	16953	9906	26578	19747	297	13412	20239
Row57	11.24	817	1317	9338	16480	15628	37958	13738	484	27806	37499
Row58	11.28	834	1077	9367	16826	25601	57616	11054	943	46322	65973
Row59	11.31	852	839	11732	18282	43520	88710	8903	1960	62140	92428
Row60	11.35	870	771	11092	15212	32317	117080	6132	1363	88810	143650
Row61	11.38	888	670	8806	6456	6781	168110	5603	758	146940	213450
Row62	11.42	906	722	8814	5427	6159	235940	6791	896	200780	301500
Row63	11.45	924	997	5070	7029	6130	360690	8536	1139	333990	447960
Row64	11.49	942	1629	1418	12590	8792	596140	13030	1875	591630	827330
Row65	11.52	961	2192	1561	16079	7867	823800	14443	2201	759250	999360
Row66	11.56	979	1870	1539	17455	8289	985220	14549	2403	838780	1181570
Row67	11.59	998	1644	1407	17863	7219	1012008	14021	2459	913160	1204100
Row68	12.03	1014	1409	1145	16280	5631	789750	12614	2805	784820	845920
Row69	12.06	1014	777	732	9797	3859	361630	5684	1113	307710	408090
Row70	12.10	1013	563	513	7318	1631	181920	4219	621	125520	168880
Row71	12.13	1012	409	351	13459	1056	87600	2550	405	74410	96973
Row72	12.17	1011	305	256	23896	726	58684	1936	272	46549	63869
Row73	12.20	1011	285	214	22800	579	44234	1629	187	32252	43806
Row74	12.23	1011	241	181	20250	456	30796	1392	142	21896	32472
Row75	12.27	1011	198	163	14911	361	20852	1143	101	15335	20435
Row76	12.30	1011	206	147	12133	342	17350	1063	95	14132	25778
Row77	12.33	993	168	123	10289	208	3788	958	58	3174	3493

FILE NAME = MW3225C
 CUSTOMER NAME = V. Eschen
 SAMPLE = MWM3225C
 SAMPLE DATE = 8 Dec 1994
 NUMBER OF MASSES = 9
 NUMBER OF SCANS = 75

***** MAIN ARRAY *****

	Col1	Col2	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Col11
Row1	TIME	TEMP	M/E12	M/E14	M/E18	M/E30	M/E32	M/E44	M/E46	M/E48	M/E64
Row2	Backgnd	=	111	94	1636	67	99	505	43	226	275
Row3	8.02	23	177	2818	639172	136	5145	1000	56	342	395
Row4	8.06	55	152	2013	313854	123	3950	820	52	273	329
Row5	8.09	82	146	1623	276747	144	3084	825	54	263	327
Row6	8.12	106	157	1576	376190	225	3167	1058	81	258	351
Row7	8.15	113	198	1479	617920	506	2488	1600	242	319	393
Row8	8.19	116	233	1468	784801	859	2446	1844	433	340	428
Row9	8.22	123	289	1471	1219860	783	2996	2832	351	461	575
Row10	8.25	129	1224	287118729300	3050	13515	22709	1358	4630	6026	
Row11	8.29	136	1200	298714524100	1598	8907	17452	601	2365	3256	
Row12	8.32	142	1040	2357	8529300	872	5493	9984	322	1344	1751
Row13	8.35	149	732	1756	3364120	642	3762	6730	181	652	742
Row14	8.39	156	501	1377	941100	599	2483	4413	108	337	434
Row15	8.42	163	481	1246	464010	1008	2284	4424	95	268	355
Row16	8.45	169	462	1310	363198	1510	2163	4218	97	249	348
Row17	8.49	176	432	1317	318510	2253	2187	4029	104	247	314
Row18	8.52	182	456	1443	291155	3185	1936	4406	102	229	299
Row19	8.55	188	451	1488	273650	3724	1958	4090	104	240	329
Row20	8.58	195	457	1610	263768	4805	2170	4081	101	239	335
Row21	9.02	202	454	1800	257357	6709	1895	4691	100	247	345
Row22	9.05	217	514	2067	297110	9938	2024	5961	114	272	341
Row23	9.08	235	685	2779	388645	17577	2087	7802	142	308	419
Row24	9.12	252	1054	4380	644890	35360	2436	14169	200	342	436
Row25	9.15	269	1704	7485	1297210	72764	2580	24344	368	349	477
Row26	9.18	286	2751	12041	1633130	112460	3204	41732	777	440	530
Row27	9.22	303	3990	13351	1308680	132280	3098	53121	1583	398	481
Row28	9.25	319	7358	17723	3332320	198860	4458	100770	3290	704	843
Row29	9.28	336	12700	29533	6827800	359360	7325	217730	9261	1247	1466
Row30	9.32	354	13790	32875	4662260	356940	7459	171500	16084	932	1062
Row31	9.35	371	9855	29243	1207270	294050	9507	113080	18922	503	543
Row32	9.39	388	9363	30877	527570	319920	17279	104540	23900	461	471
Row33	9.42	405	11123	33212	459707	308880	26453	130830	31026	461	403
Row34	9.45	422	16745	41403	409435	425650	38781	209500	36769	494	417
Row35	9.49	439	32574	68482	413995	780090	53176	474250	39980	582	515
Row36	9.52	456	125467	228716	609310	2666100	89164	1861200	57570	980	996
Row37	9.56	473	100593	193274	397510	1959700	107721	1219700	49742	783	712
Row38	9.59	491	53794	110078	239685	975860	143820	621830	23377	482	442
Row39	10.03	508	27253	63279	140981	602720	122781	327310	9612	313	288
Row40	10.06	525	15776	31409	92439	277470	67380	189300	2979	189	223
Row41	10.10	542	16054	14926	72357	134350	33167	175760	1440	149	188
Row42	10.13	559	16892	7732	63695	57121	11241	210240	936	139	156
Row43	10.16	576	20371	3604	56763	27051	3926	208660	998	133	165
Row44	10.20	593	14434	2925	49842	19627	2408	190010	800	131	162
Row45	10.23	610	11790	2592	48954	16808	2005	130840	548	120	159
Row46	10.26	626	9368	2628	41252	14565	1948	108650	478	129	164
Row47	10.30	642	8407	2595	39663	14578	1911	92680	387	132	168

Row50	10.33	692	6424	3463	35585	13224	2542	67380	516	186	260
Row51	10.43	709	6133	2092	28274	9191	2220	65280	286	329	467
Row52	10.46	725	6056	1896	27079	7429	2305	62609	266	909	1405
Row53	10.49	743	6256	1751	23451	5241	2050	58407	270	3690	4715
Row54	10.53	760	6481	1627	24953	4443	4795	57164	307	11862	16971
Row55	10.56	777	6144	1683	24415	5421	10159	57096	388	25738	41060
Row56	11.00	794	6715	1773	24427	6393	16346	64595	471	50976	75650
Row57	11.03	812	8205	2199	27084	9601	23037	67670	533	74190	113110
Row58	11.06	831	10974	2574	30647	14885	34281	81140	796	101190	144820
Row59	11.10	849	17373	3023	35385	15522	45615	117220	1075	144610	190140
Row60	11.13	867	23357	2330	42541	4987	58218	168300	1324	158220	252520
Row61	11.17	885	33001	2325	49603	4377	58483	229110	1638	176850	230280
Row62	11.20	903	46865	2592	80748	4366	62040	340710	1912	173520	270290
Row63	11.24	921	62452	3014	105187	4784	70980	397350	2242	208220	289360
Row64	11.28	940	92205	3788	128662	6523	111010	811170	4602	376770	637780
Row65	11.31	959	226055	7219	188016	10970	230780	1573900	10068	723240	1154840
Row66	11.35	979	237575	7707	126732	12254	275540	1242750	9850	691570	1125230
Row67	11.39	999	310959	9982	134574	15181	334520	1391720	12076	1017460	1292300
Row68	11.43	1014	166864	7673	79197	11593	239100	953290	10064	683920	820670
Row69	11.47	1014	124500	4053	46627	6286	131215	450360	4137	319190	256480
Row70	11.50	1013	50608	3230	29167	3357	42850	82600	3895	155460	151140
Row71	11.54	1011	60817	2378	24154	2111	54496	165950	1275	95220	153840
Row72	11.58	1011	49017	1765	16318	2055	60212	117310	959	41304	114090
Row73	12.01	1011	29906	1445	18299	1117	36330	32034	229	82810	54840
Row74	12.05	1011	39931	1420	13333	1827	23991	121010	901	45698	53807
Row75	12.08	1011	32955	1311	12251	1328	28513	54410	634	51550	58833
Row76	12.12	980	10295	698	10161	806	14287	45055	512	15414	21428
Row77	12.15	855	1042	520	7237	138	2539	4295	69	2946	6916