Wood Waste Boiler Survey

Prepared by:

Washington State Department of Ecology
Air Quality Program

97-204
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Acknowledgments

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Wood Waste Boiler Survey

Background

The air pollution source category "wood waste boilers" has needed examination for a number of years. The current regulations, found in Chapter 173-400 WAC, *General Regulations for Air Pollution Sources,* were written in the early 1970s and are primarily concerned with boilers that combust only wood waste (hogged fuel).[a] In the past few years, wood waste boilers have been listed as a potential source category on the 1994, 1995-6 Reasonable Available Control Technology (RACT) List and Schedule. On the 1996 RACT List and Schedule, wood waste boilers are listed as a Group Al source, which means that a RACT review will occur within the next two years or by 1998. As a result, the Washington State Department of Ecology began collecting data in June 1996 to supply additional information about the existing wood waste boilers in Washington. For this survey, a wood waste boiler was defined as any industrial combustion unit which uses wood or bark for any of its heat input.[b][b]

Methodology

The primary goal of this survey was to classify the population of wood waste boilers in Washington. This involved locating all the operating wood waste boilers and acquiring relevant information about each boiler. These two steps were partitioned into the following four phases:

- **Phase 1: Classifying/Locating**

  The first step of Phase 1 was to create an initial list of wood waste boilers by querying the Department of Ecology's Washington Emission Data System (WEDS) by Standard Industrial Classification (SIC) code. Local air pollution control authorities were contacted and lists of possible facilities with wood boiler units were obtained. Some facilities were contacted to verify the status of operation of their wood fired boiler units..

- **Phase** 2: **Data Gathering**

  Data for the facilities were obtained by contacting each local air authority and searching their files for information about their respective wood waste boiler units.

  Some of the key pieces of information sought were: boiler design, control equipment, types of fuels, fuel rates, operating practices, and age of equipment. This information was then added to the data gathered from the WEDS database.

[a] For the purposes of this document, the Department of Ecology will use the term wood waste to include hogged fuel. Hogged fuel is wood/bark that has been fed through a "hogger" or grinder for the size reduction. Wood waste/hogged fuel for this survey is defined as only wood and/or bark constituents.
[b] Industrial boilers which combust wood pellets as their only wood fuel have been excluded from this study.

- **Phase 3: Creating Database**

  In order to organize and evaluate the information gathered in the previous phases, a database was created. Forms were also prepared to display the relevant information of each wood-fired boiler. (A sample form is shown in Appendix **B.)**

- **Phase 4: Data Review/Addition**

  In October 1996, letters were sent out to the local air authorities with forms containing the acquired data for each facility with a wood fired boiler unit. The control authorities reviewed the forms for accuracy and supplied some of the missing data. These "updated" forms were then incorporated into the wood waste boiler database. On December 4, 1996, letters were sent out to each facility with their respective source-specific data sheet for review and to supply any missing data. Due to time constraints and project deadlines, only information received before the second week in February was used for this report and data analysis. As of February 18, 79 percent of the facilities responded to the questionnaire.

Summary of Survey Results

There are 85 wood-waste boilers currently in operation in Washington. These boilers are very diverse in terms of design, configuration, operation, control equipment, ages, and composition of fuels. These boilers are mainly operated by two major industries: "lumber and wood products," and "paper and allied products."
Roughly 3.3 million tons of wood are combusted each year in the state of Washington. In addition to wood waste, a variety of other fuels are combusted and account for 36 percent of the total heat input for wood waste boilers in Washington. These fuels include refuse derived fuel (RDF), old corrugated cardboard (OCC), tire derived fuel (TDF), primary and secondary pulp mill sludges, natural gas, coal, and oil. The paper and allied products industries account for 45 percent of the wood used, but comprise 23 percent of the total number of boilers. They also constitute 68 percent of the boilers that use three or more fuels. At least 20 percent of all the boilers use salt-laden wood (salty hog).[c]

Pollution control equipment for wood waste boilers in Washington is focused on particulate matter (PM) removal. Control devices used range from none to multicyclone plus baghouse. Twenty-five percent of the boilers have no control or only a multicyclone for particulate matter control. The ages of boilers and controls vary greatly within the state. The average age for a boiler is 31 years and the average age of control equipment is 15 years. There is a tendency for the older and less efficient controls (i.e., multicyclone, wet scrubber) to be associated with the older boilers. Additionally, 32 percent of the boilers practice flyash/char reinjection. Flyash/char reinjection means that large uncombusted matter collected from the flue gas stream is reintroduced into the combustion chamber.

[c] Salt-laden wood or salty hog is defined for this report as being any wood constituent that has been stored or transported in salt or brackish water.

Wood Waste Boiler Survey Results

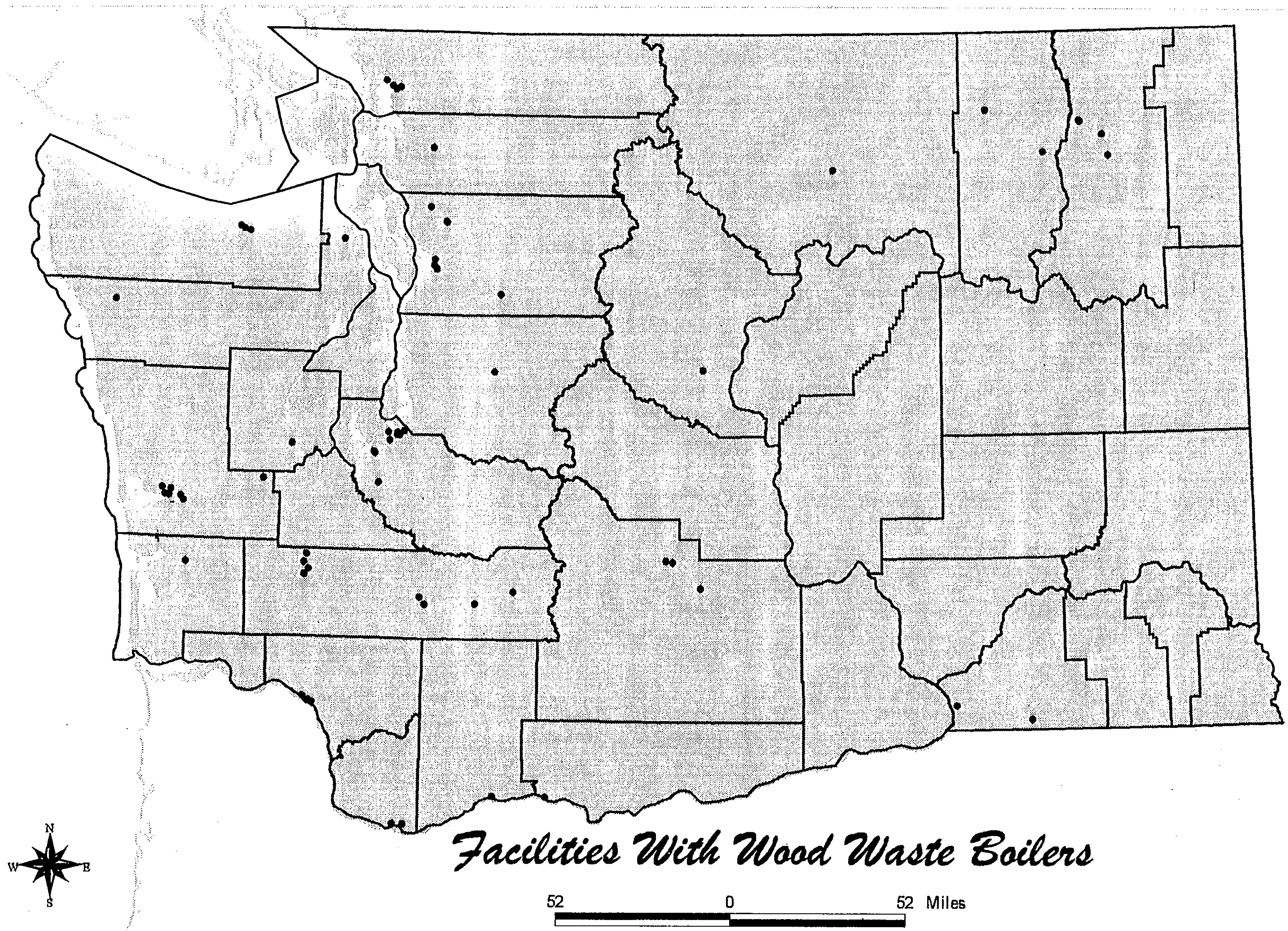
Location

In Washington, there are 67 facilities that operate hog fuel or wood waste boilers. Overall, these facilities operate a total of 85 wood waste boiler units. These boilers are located throughout Washington (see map), but are predominately located in western Washington.

A wood waste boiler for this survey was defined as any industrial combustion unit which uses wood or bark for any of its heat input. The exception to this rule was to exclude units which combusted purchased pelletized wood as their only wood source.

Jurisdiction

These facilities are regulated for air pollution emissions by either Ecology, a local control authority, or EPA/Indian reservation. There are 10 air pollution control authorities in Washington (see map). Wood waste boilers are located in seven of these 10 regional jurisdictions. Some of these facilities are regulated by the Department of Ecology's Central Programs. Ecology's Central Programs has jurisdiction over the pulp and paper industry regardless of location. A few of the facilities are located on Indian reservations and are regulated jointly by the EPA and the Tribes. As shown in Table 1, the control authorities that regulate the most boilers are Ecology's Central Programs and the Puget Sound Air Pollution Control Authority.


N
W
E
S
Facilities With Wood Waste Boilers
52 0 52 Miles

Air Pollution Control Authorities

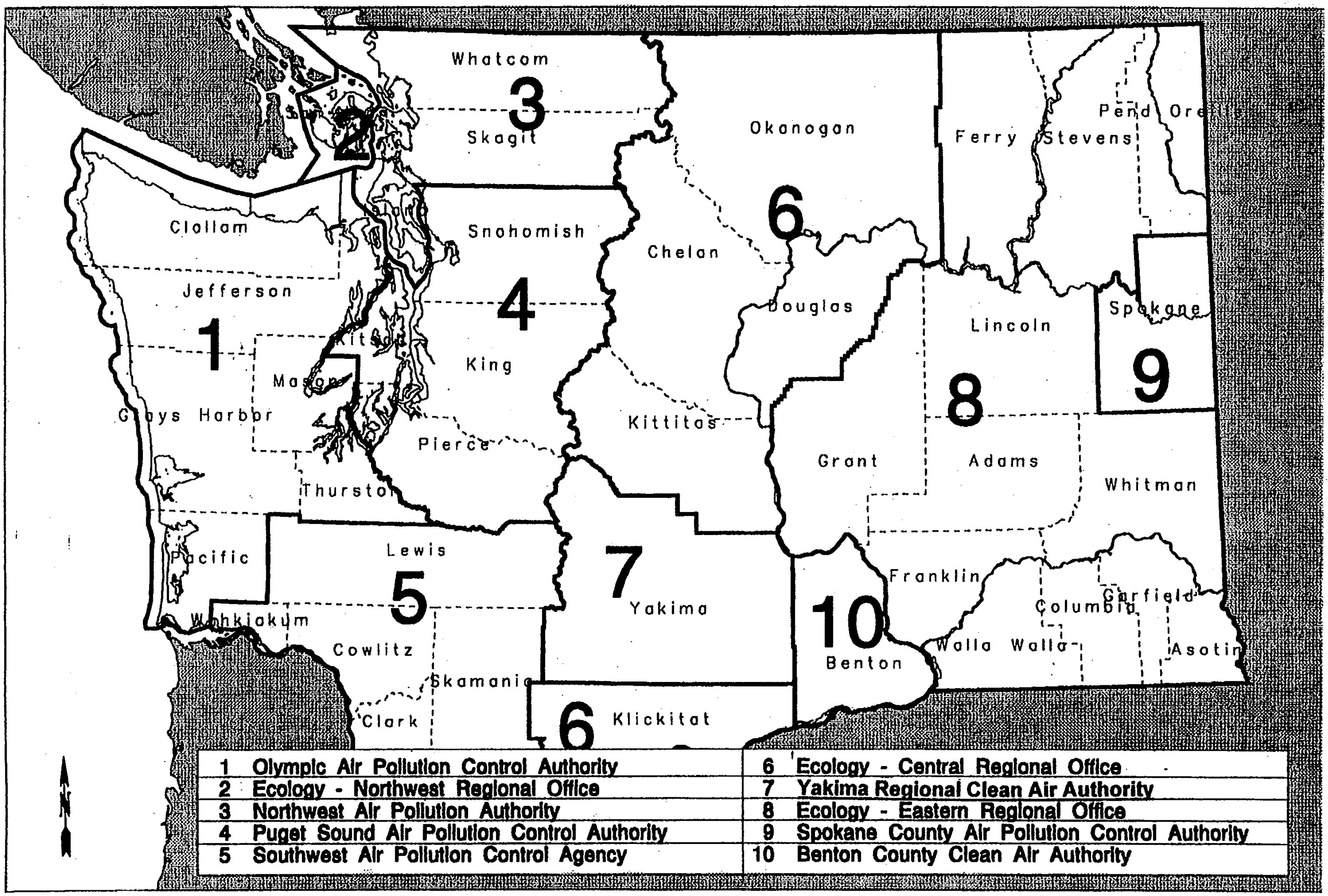


Table 1

Control Authority	# of boilers	% of total
Ecology - ERO		
Ecology - CRO		
PSAPCA		
NWAPA		
SWAPCA	12	14.1
OAPCA	13	15.3
YRCAA	3	3.5
Ecology - Central Programs	21	24.7
Indian Reservation/EPA	3	3.5
TOTAL	85	100

After grouping these facilities by their Standard Industrial Classification (sic) major group number, four groups emerge (SIC two digit code):

- lumber and wood products
- paper and allied products
- electric, gas, and sanitary services
- health services

Of these four groups, "lumber and wood products" and "paper and allied products" dominate the number of wood waste boilers. Table 2 classifies these major groups into their respective industry groups (SIC three digit code):

Table 2

Industry	# of Boilers
Sawmills and Planing Mills	37
Millwork, Veneer, Plywood, and Structural Wood Members	24
Pulp Mills	11
Paper Mills	5
Paperboard Mills	3
Electrical Services	3
Hospitals	1
Unknown (Not Reported)	1

Overall, the "lumber and wood products" represent about 72 percent of the boilers.

Fuels

Wood waste boilers throughout the state combust a variety of fuels in order to meet their particular heat input needs. Choice of fuel is dependent on a number of factors which include: fuel economics, administrative permits, regulation requirements, boiler design, and fuel supply characteristics. After comparing annual heat inputs for these boilers, the boiler units can be broken up into two groups - those using only wood waste and those using wood waste plus other fuels.

Wood waste for this survey is defined as only wood and/or bark constituents. Other fuels range from natural gas to tire derived fuel (TDF). Wood waste accounts for about 64 percent of the annual heat input for all the boilers, (Graph 1), with the remaining 36 percent of the total annual heat input from other fuels. This indicates that some of the wood waste boilers might not match the original concept of what a wood waste/hog fuel boiler as described in Chapter 173-400 WAC, *General Regulations for Air Pollution Sources.* This distribution is further skewed when only the boilers that combust wood and one or more fuels are evaluated (Graph 2). In other words, the "exclusive" wood waste boilers that only use wood/bark as a fuel source are taken out of the analysis. For units that combust wood and one or more fuels, only 52 percent of the annual heat input is from wood.

Wood-Waste

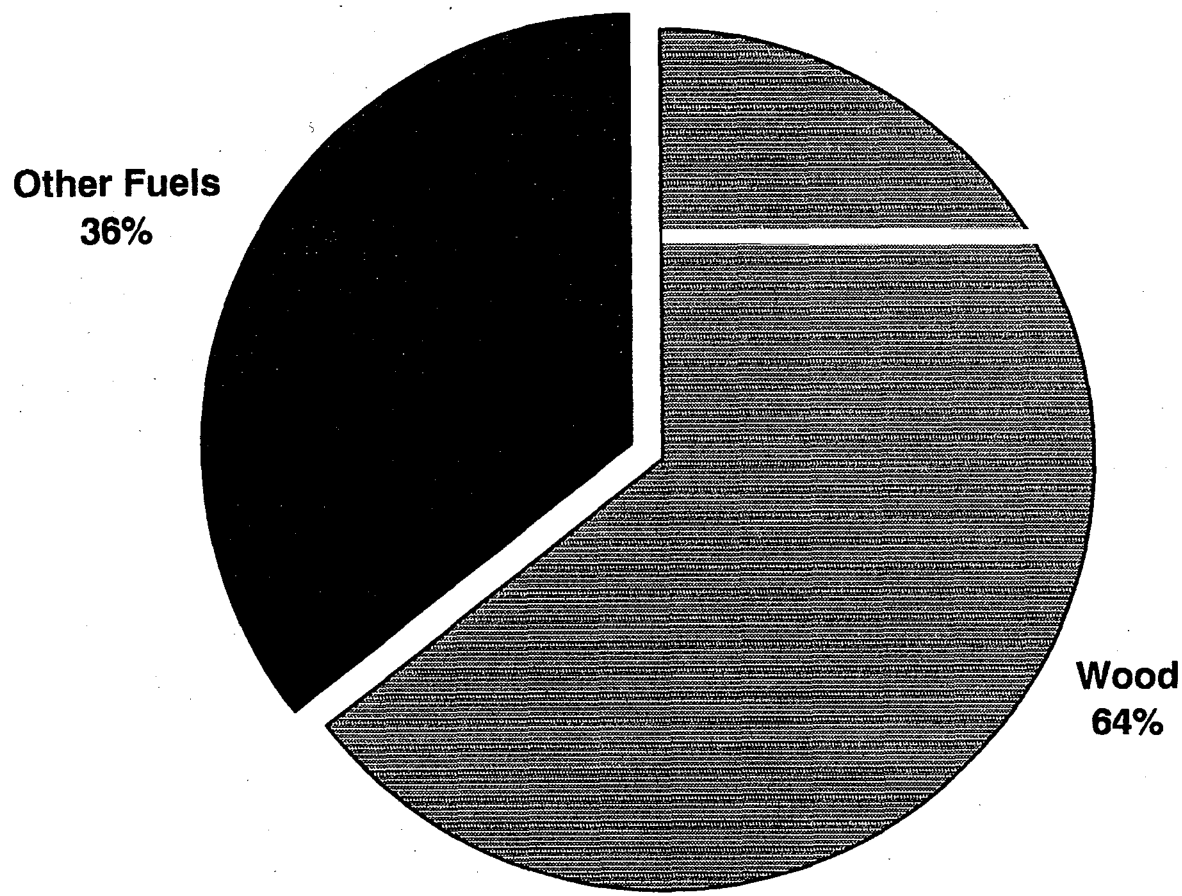
In Washington, approximately 3.3 million tons of wood waste are combusted each year. This percentage is divided by industry type and is displayed in Table 3. Notably, this table reveals that the lumber and wood products industries operate almost three-fourths of wood waste boiler units, but these industries do not utilize a majority of the wood combusted in Washington. Thus, most of the larger boilers are represented by the paper and allied products industries.

Table 3

Industry	% of Boilers	% Wood Combusted
Lumber and Wood Products	72.6	39
Paper and Allied Products	22.6	45
other	4.8	16

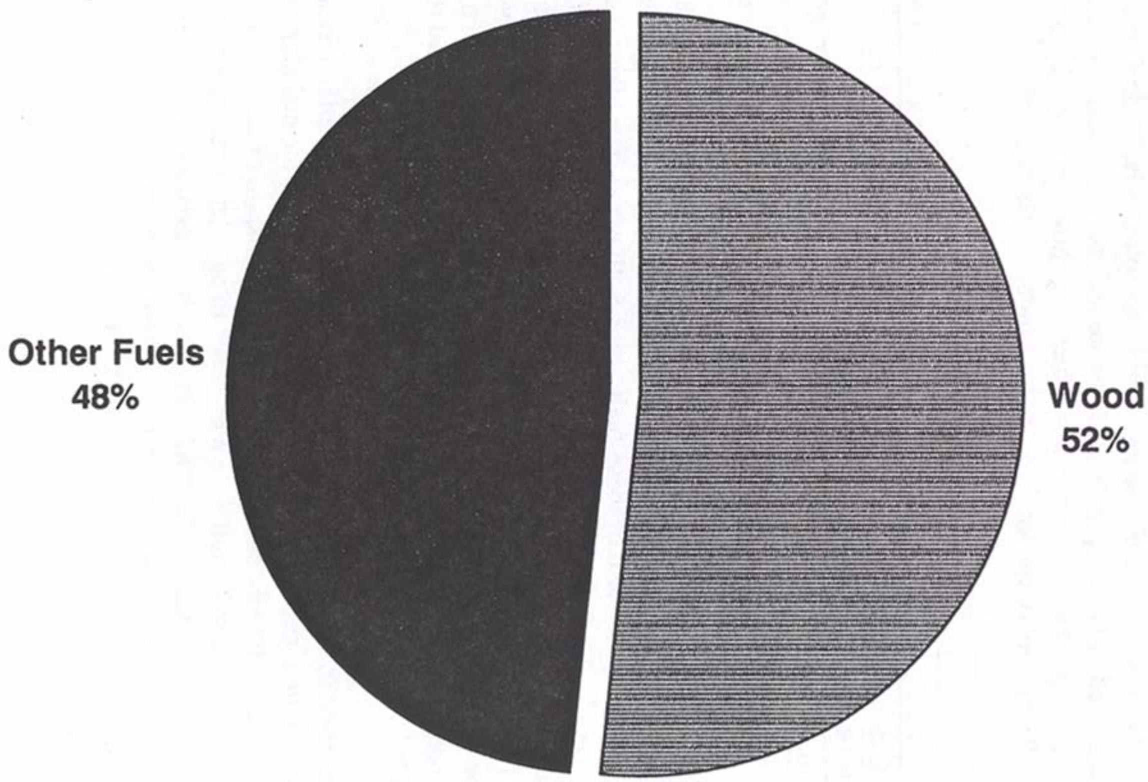
One characteristic that needs to be analyzed for wood fuels is whether the wood has been stored or transported in salty or brackish water. Based on the information received, 24 percent of the boilers combust salt-laden wood. Of the boilers that combust salt-laden wood, 22 percent of their total wood fuel is salt-laden. During the storing or transporting of logs in salt water, the salt content of the wood rises to 0.7 - 1.6 percent (EPA, 1983).' Salt particles that are adsorbed or entrained in the wood are very small particles (less than 1 micron). As a result, when salt-laden wood is combusted both the flue gas's fine particulate loading and plume opacity increases. For example, about one percent of the particulate matter generated by the combustion of typical "clean" or non-salt laden wood is less than one micron in diameter. When salt-laden wood is combusted, about 28 percent of the particles are less than one micron in diameter (Brady, 1980).[2] Another concern of salt-laden fuel is the increased potential of hazardous air pollution formation. The formation of polychlorinated diobenzo-p-dioxins increases about a factor of a hundred for each ton of salt-laden wood combusted compared to non-salty wood (EPA, 1996).[3]

Annual Heat Input for all Wood Waste Boilers



Graph 1

Annual Heat Input for Only Wood Waste Boilers that Combust Wood and Other Fuels



Graph 2

Other Fuels

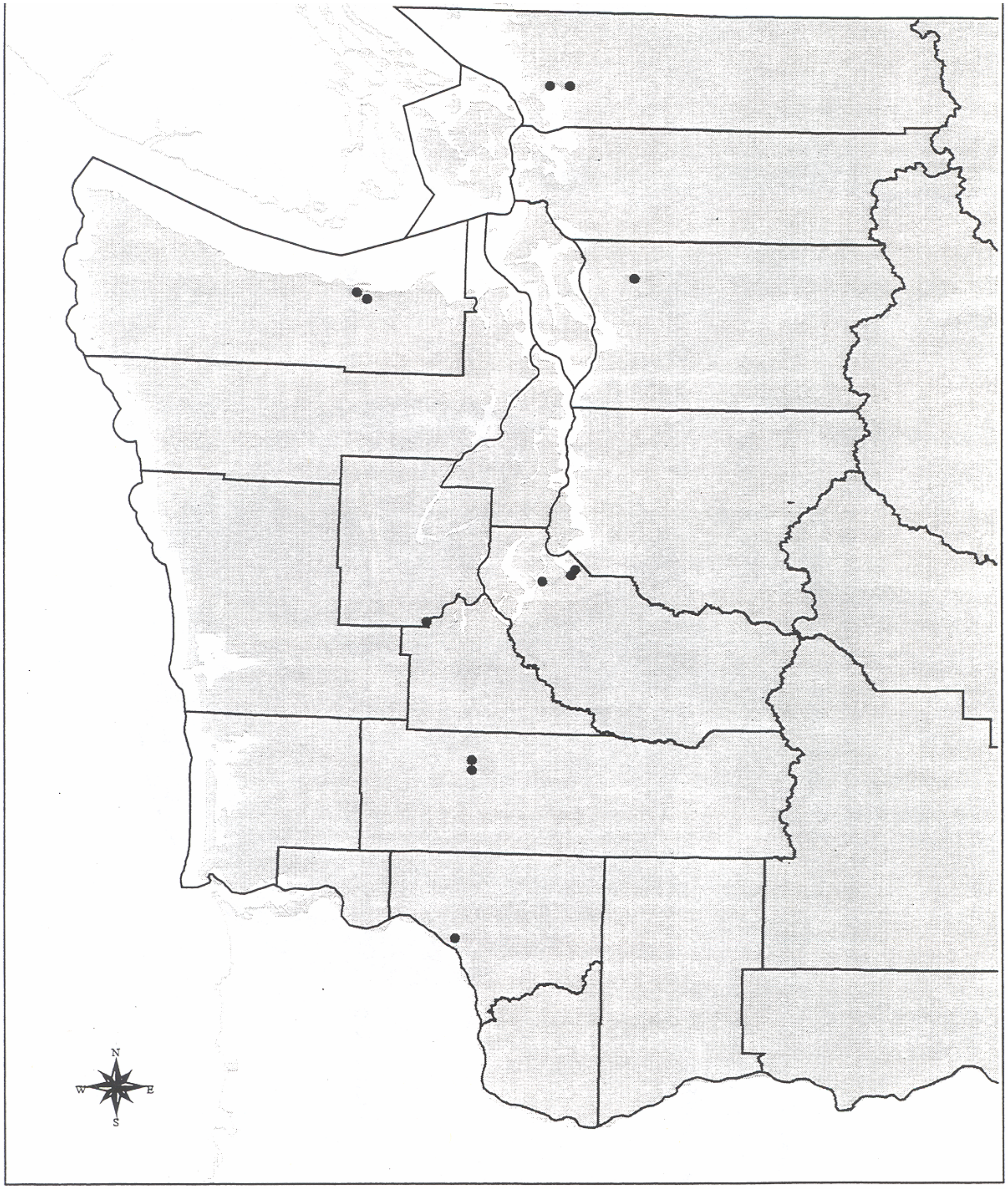
This broad category of other fuels accounts for a significant proportion of the annual net heat input for wood waste boilers (about 36 percent of total energy input is from other fuels). "Other fuels" include gaseous, liquid, and solid fuels. Table 4 lists the major non-wood fuels used in Washington's wood waste boilers. This list is comprised of both traditional "by-product" fuels and waste fuels. As shown in Graph 3, fossil fuels account for about 83 percent of the total annual heat input of this category of other fuels.

Table 4

Coal	Old Corrugated Cardboard, (OCC)
Natural Gas	Refuse Derived Fuel (RDF)
Fuel Oils (Residual & Distillate)	Tire Derived Fuel (TDF)
Turpentine	Fiber Derived Fuel (FDF)
Primary & Secondary Sludges	Deinked Fiber

At least one of these fuels is used in addition to wood waste in 48 percent of the boilers. This percentage decreases with the number of fuels used. For example, only 29 percent of the boilers use at least two of these fuels along with wood. The major industries that operate these boilers are the paper and allied products industries (about 68 percent of the boilers that combust at least two of these fuels along with wood are from paper and allied products industries). There is a grouping of boilers that appear to receive a greater annual heat input from these other fuels than from their wood fuels. Presently, this group includes eight percent of the all the wood fuel boiler units. Eighty-six percent of these boilers are represented by paper and allied products industries.

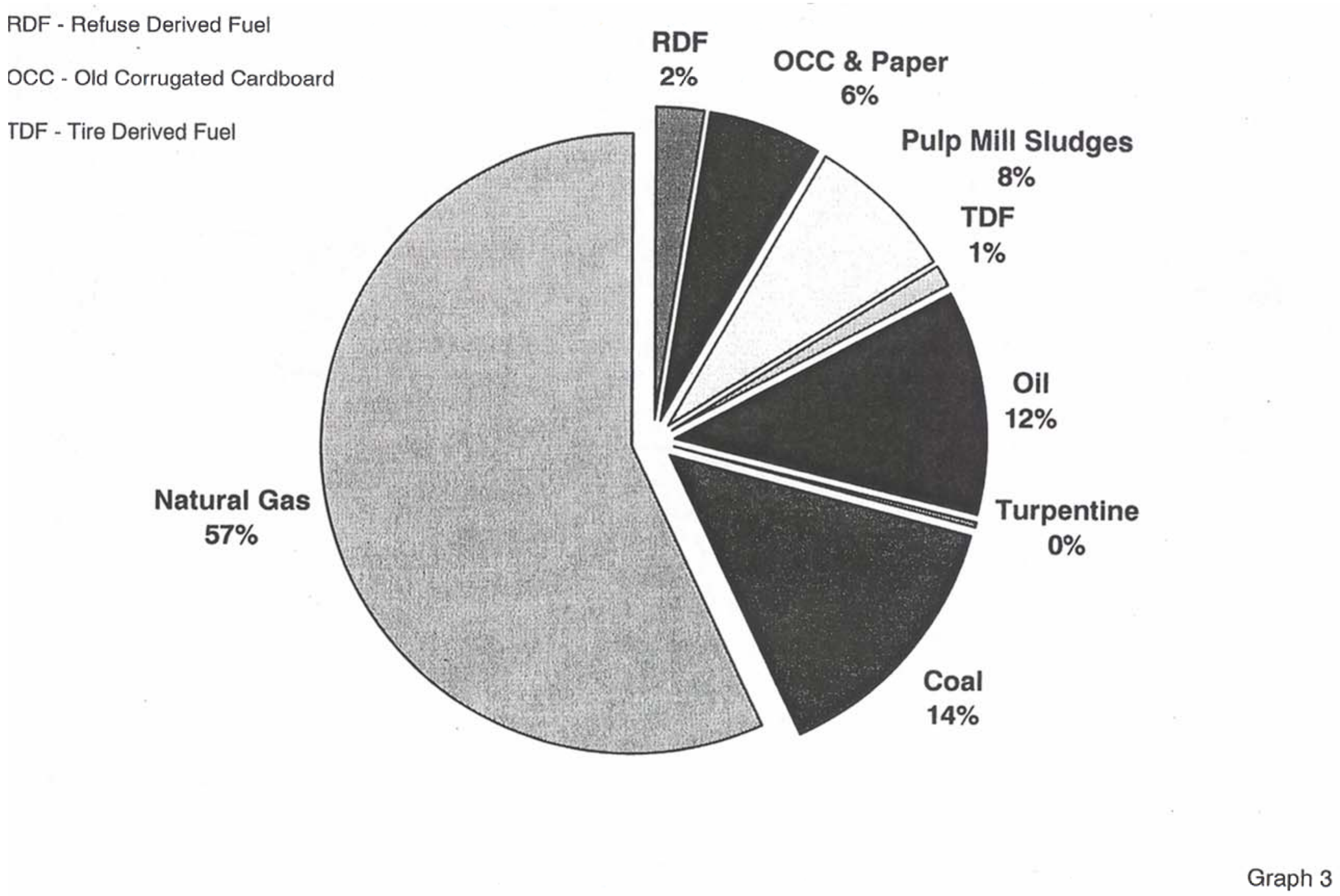
Each fuel used in a combustion unit has its own emission potential or characteristics. The emission potential depends on the physical constituents of the fuel along with the combustion operating practices. Coal and residual oils, for example, contain a high sulfur content and when combusted have a potential to emit large quantities of sulfur dioxide. The abundant use of these other fuels changes the emission characteristics in comparison to wood combustion. Thus, other pollutants that would not normally be addressed when wood is the only fuel source, might need to be controlled.



Facilities With Wood Waste Boilers - Salt-Laden Wood

46 0 46 Miles

Annual Heat Input for Wood Waste Boilers from Other Fuels Excluding Wood



Control Equipment

Air pollution control equipment for wood fired boilers in Washington has focused solely on the removal of particulate matter. An exception to this is that one facility, located in a former ozone non-attainment area, operates ammonia injection for the control of nitrogen oxides. Particulate matter control equipment ranges in removal efficiency from no control to a combination of a multicyclone and baghouse (Graph 4). As shown by Graph 5, the most common control equipment installed is a mechanical collector in series with a scrubber. Also, 25 percent of the wood fuel boiler units operate with a particulate matter control efficiency of either a mechanical collector or less.

Grouped by industry, Graph 6 illustrates that the lumber and wood products industries are dispersed among the various types of control equipment. The paper and allied products industries tend to be associated with the higher-efficiency control equipment.

The following types of control equipment have been ranked by their relative particulate matter removal efficiency (lowest to highest): multicyclone, wet scrubber, electrified filter bed (EFB), electrostatic precipitator (ESP), and baghouse. Particulate removal efficiencies are primarily dependent on particle size. All of these control equipment are less efficient in controlling particles between 0.3 to 3 microns in diameter (EPA).[4] The magnitude of the drop in efficiency is dependent on the type of control equipment. A ranking of these controls is the same as above (largest drop to smallest drop or least efficient to best efficient): multicyclone, wet scrubber, electrified filter bed (EFB), electrostatic precipitator (ESP), and baghouse. Thus, the multicyclone has the largest drop in efficiency for this size of particulate matter.

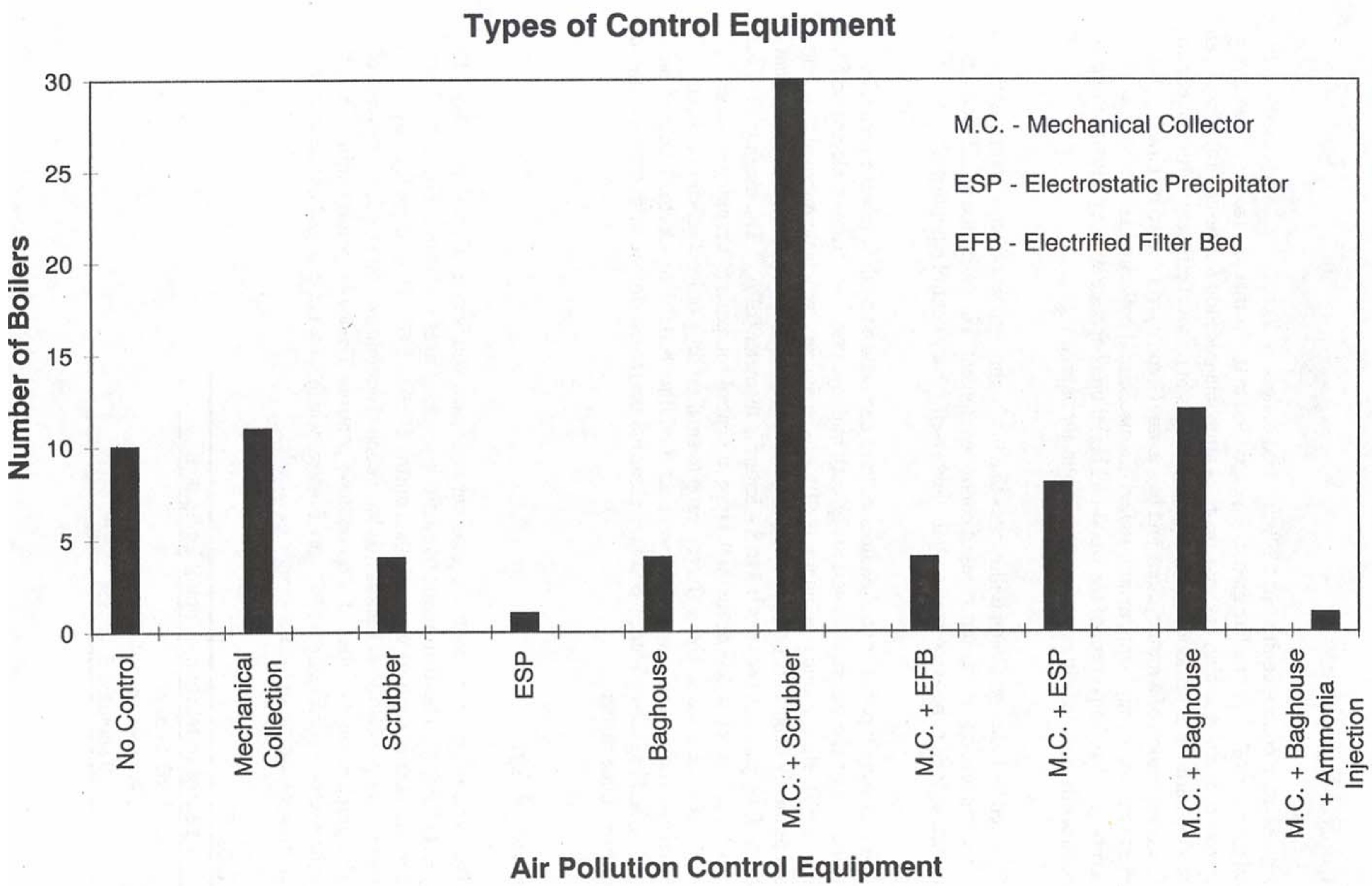
Control Age

The average age of the control equipment associated with wood fuel boilers is about 15 years (Table 5). The distribution of control equipment ages is shown in Graph 7. Over one-third the of controls were installed during 1970 to 1979. Thus, there is a large segment or population of boilers that have control equipment that is at least 20 years old. This graph excludes boilers that do not have controls. These two points confirm the existence of a significant percentage of boilers which have not changed or added new control equipment in the last couple of decades.

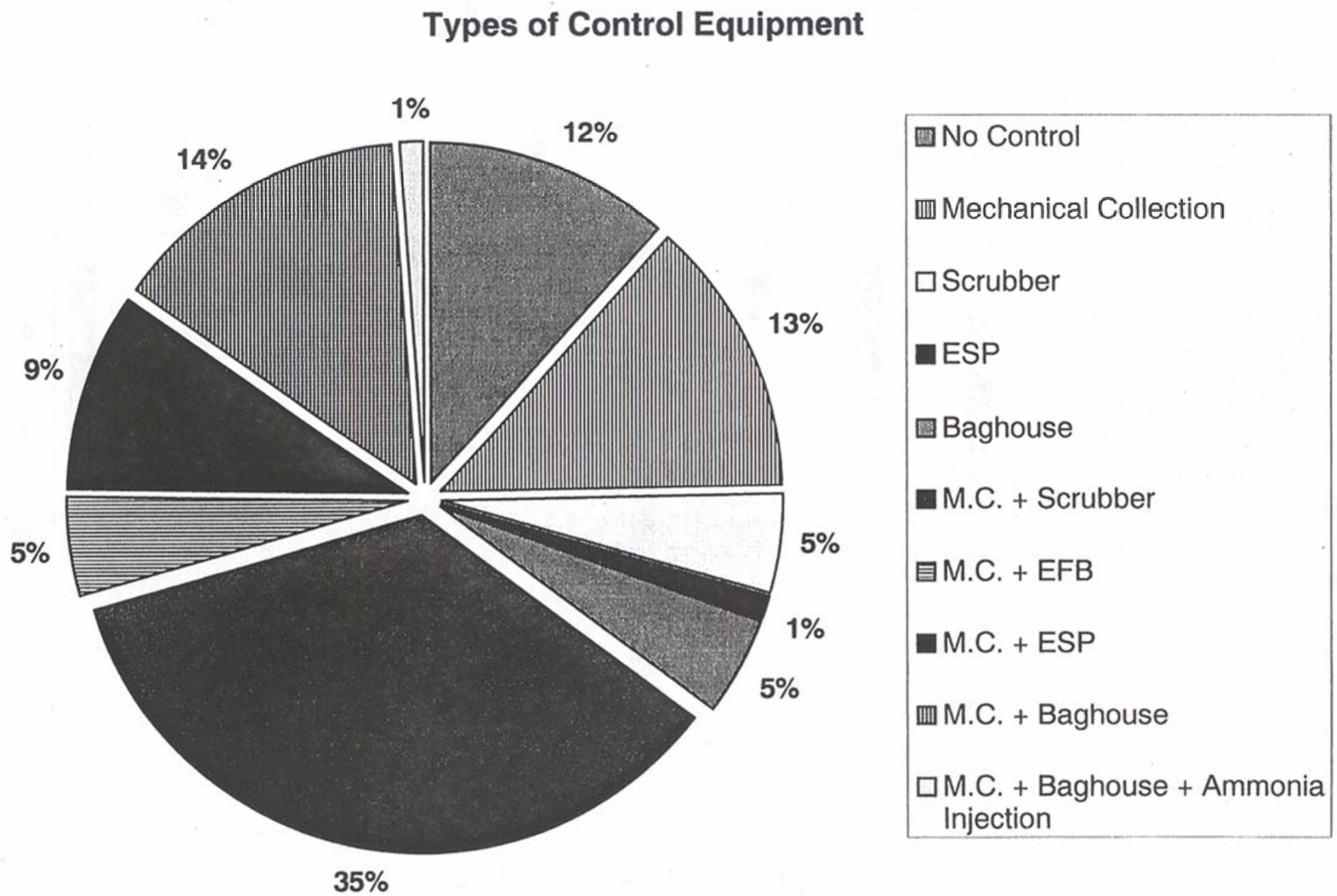
Table 5

Year of Installation - Control Equipment

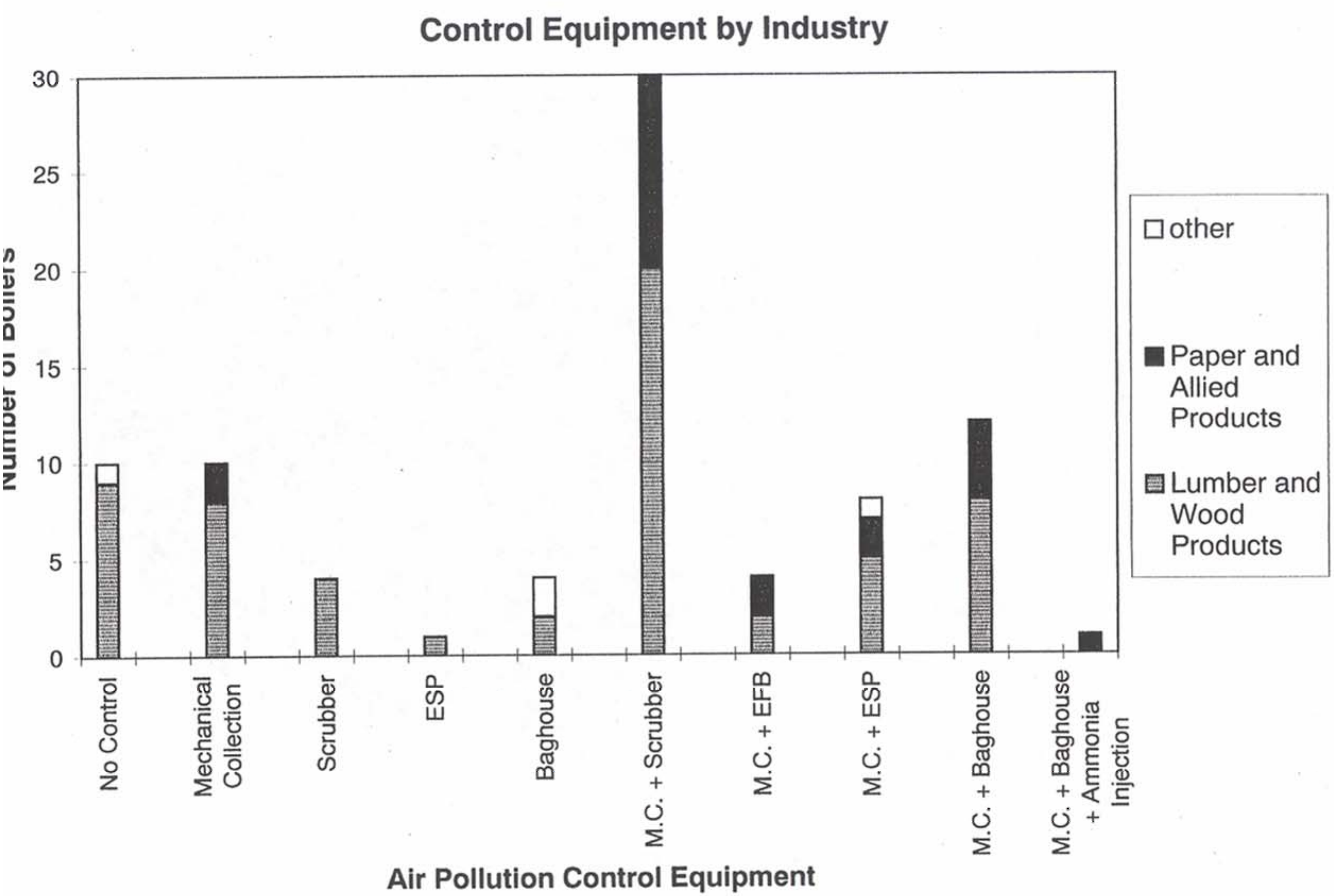
1982	average
1982	median
9	standard deviation


Types of Control Equipment
M.C. - Mechanical Collector
ESP - Electrostatic Precipitator
EFB - Electrified Filter Bed
Number of Boilers
0
5
10
15
20
25
30
No Control
Mechanical Collection
Scrubber
ESP
Baghouse
M.C. + Scrubber
M.C. + EFB
M.C. + ESP
M.C. + Baghouse
M.C. + Baghouse + Ammonia Injection
Air Pollution Control Equipment

Graph 4

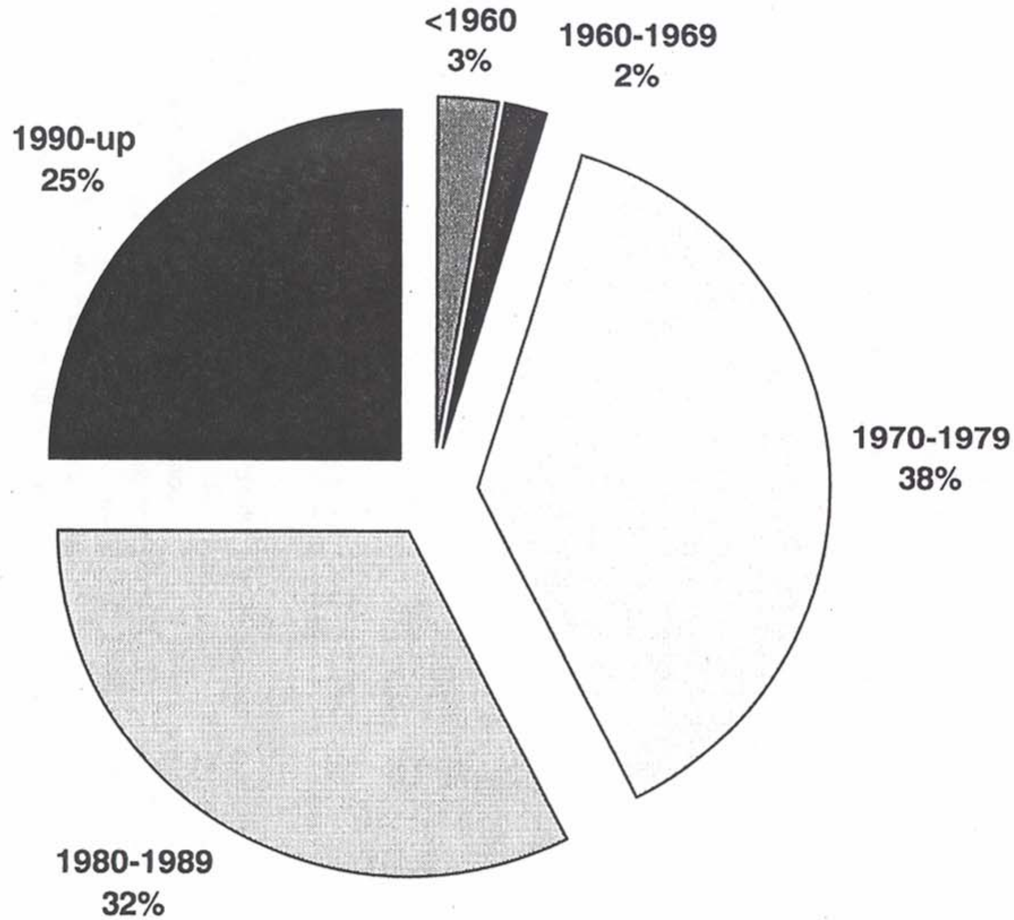

Types of Control Equipment
1%
12%
14%
13%
9%
5%
5%
1%
5%
35%
No Control
Mechanical Collection
Scrubber
ESP
Baghouse
M.C. + Scrubber
M.C. + EFB
M.C. + ESP
M.C. + Baghouse
M.C. + Baghouse + Ammonia Injection

Graph 5


Control Equipment by Industry
Number of Boilers
30
25
20
15
10
5
0
No Control
Mechanical Collection
Scrubber
ESP
Baghouse
M.C. + Scrubber
M.C. + EFB
M.C. + ESP
M.C. + Baghouse
M.C. + Baghouse + Ammonia Injection
Air Pollution Control Equipment
other
Paper and Allied Products
Lumber and Wood Products

Graph 6

Age of Air Pollution Control Equipment



Graph 7

Average Boiler

Wood fired boilers can be differentiated by their design types, steam capacities, ages, and operation practices. An average boiler in Washington would have the following characteristics (see Graphs 8-9):

- Design Capacity -- 97,000 lbs. of steam/hr
- Actual Firing Rate (about 76% of Design Capacity) -- 74,000 lbs. of steam/hr
- Wood Consumption -- 42,900 tons of wood-waste combusted per year

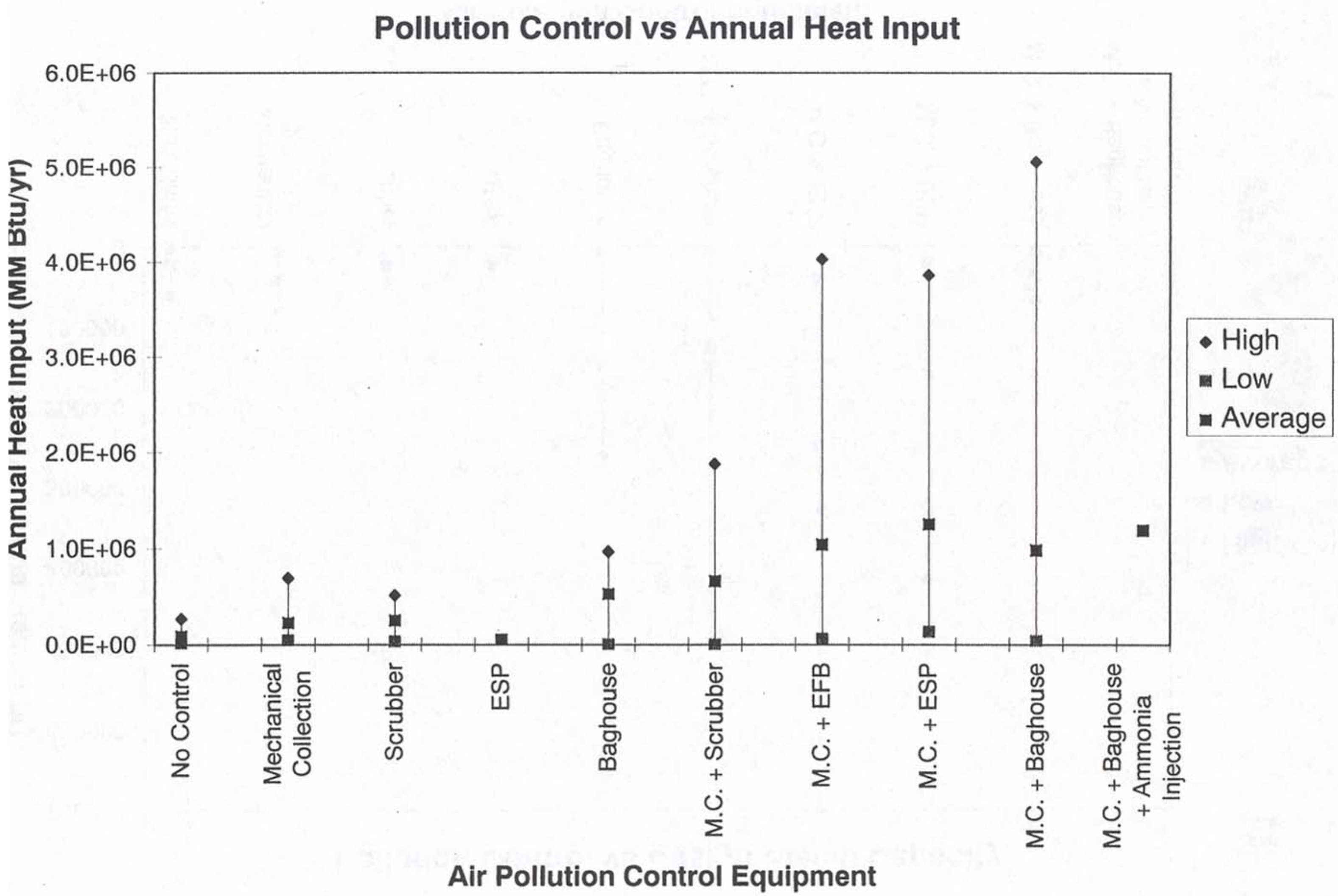
Boiler design types or firing practices in Washington can be characterized by four types: pile burners (Dutch oven & fuel cell), spreader stokers, suspension burners, and fluidized bed burners. Table 7 shows the percentages of the boilers by their respective design. The boilers in Washington are mainly pile burners and spreader stokers.

Table 7

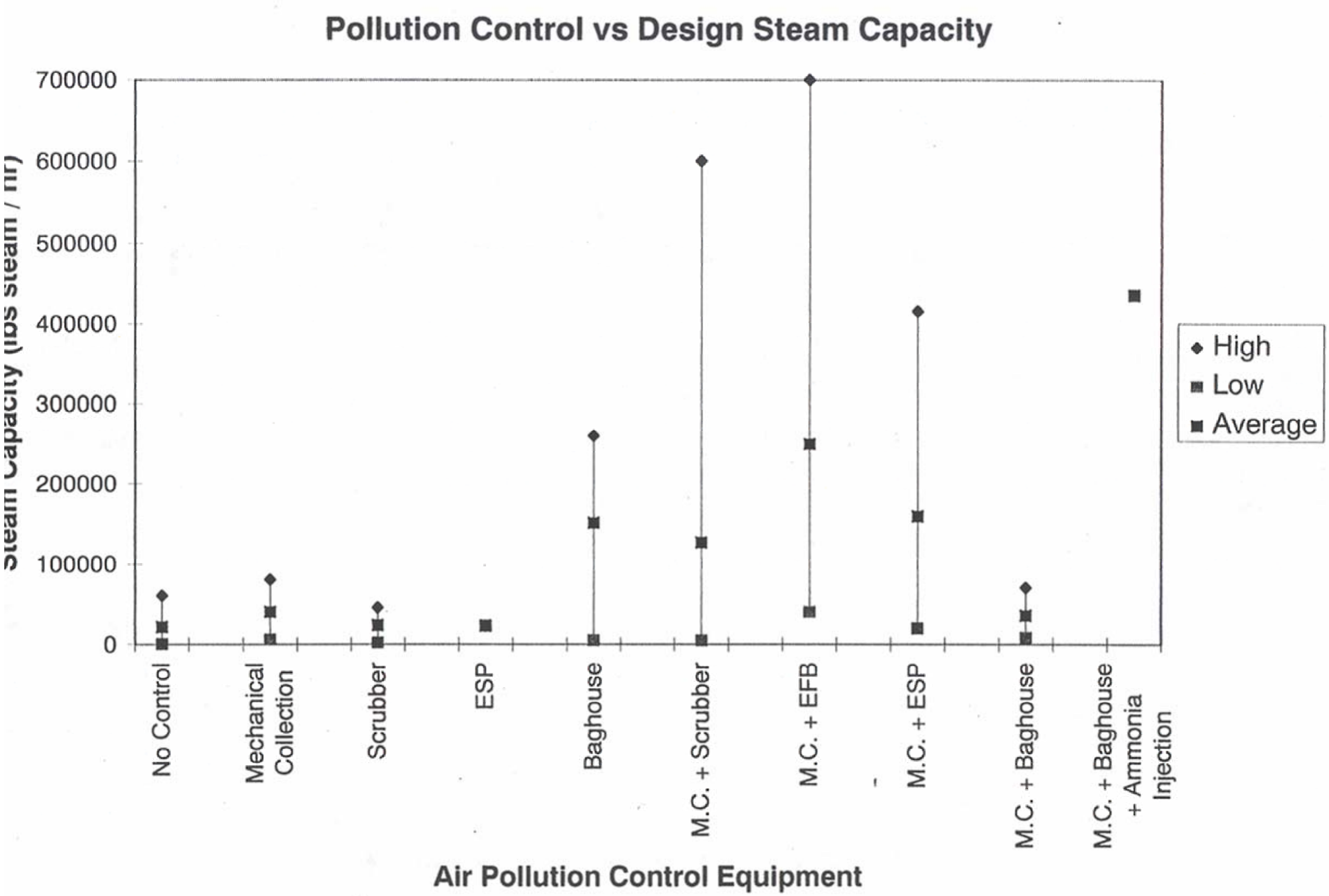
Types of Boiler Design	# of boilers	
Spreader Stoker	24	37.5
Dutch Oven	22	34.4
Fuel Cell	13	20.3
FBC	2	3.1
other	3	4.7
	64 out of 85 boilers reported	

Pile burners are combustion units in which the fuel is deposited or dropped onto the grates, and combusts in a cone-shaped pile. The two major types of pile burners are Dutch ovens and fuel cells. The Dutch oven is comprised of a cell with refractory lined walls (Babcock & Wilcox, 1992).[5] These refractory lined walls allow the unit to combust fuels with high moisture contents, but are unable to accommodate quick swings in the steam loading. In Washington, these boilers have a tendency to be the oldest boilers with an average age of 43 years. Fuel cells, on the other hand, are newer with an average age of 14 years.

The second type and most commonly used boiler in Washington is the spreader stoker. Spreader stokers operate by pneumatically or mechanically distributing the fuel evenly across the grate. Fine particles are combusted in suspension while the larger particles fall onto the grate and form an even layer or bed. The average age of spreader stokers in Washington is 38 years.


Pollution Control vs Annual Heat Input
Annual Heat Input (MM Btu/yr)
6.0E+06
5.0E+06
4.0E+06
3.0E+06
2.0E+06
1.0E+06
0.0E+00
No Control
Mechanical Collection
Scrubber
ESP
Baghouse
M.C. + Scrubber
M.C. + EFB
M.C. + ESP
M.C. + Baghouse
M.C. + Baghouse + Ammonia Injection
Air Pollution Control Equipment
High
Low
Average

Graph 8


Pollution Control vs Design Steam Capacity
Steam Capacity (lbs steam / hr)
700000
600000
500000
400000
300000
200000
100000
0
No Control
Mechanical Collection
Scrubber
ESP
Baghouse
M.C. + Scrubber
M.C. + EFB
M.C. + ESP
M.C. + Baghouse
M.C. + Baghouse + Ammonia Injection
Air Pollution Control Equipment
High
Low
Average

Graph 9

The third type of boiler is the fluidized bed combustor (FBC). In an FBC, the wood fuel combusts on top of an inert layer of fine solids that is suspended by an air stream. Wood fuel with high moisture contents (up to 67 percent) (EPA, 1982)[6] can be combusted with minimal uncombusted material.

Lastly, the suspension burner is used only for fine wood particles. This type of unit combusts the fuel by supporting it by an air stream rather than on a grate. Only wood with a small particle size and low moisture content is able to combust under these conditions.

Boiler Age

The ages of boilers in Washington range from 78 years to less than two years (Graph 10). The average age for a wood fired boiler is approximately 31 years (Table 8). The diversity of boiler ages is represented by the large standard deviation and in Graph 8.

Table 8

Year of Installation - Boilers

- 1966 average
- 1974 median
- 20.6 standard deviation

There also seems to be a pattern that the less efficient controls tend to be older and associated with the older boilers (Graph 11). This tendency is significant because the older boilers will most likely have the lowest combustion efficiency and would have an increased emission potential of criteria and hazardous air pollutants.

Boiler Operation

Boiler operation is shown in table 6 below.

Table 6

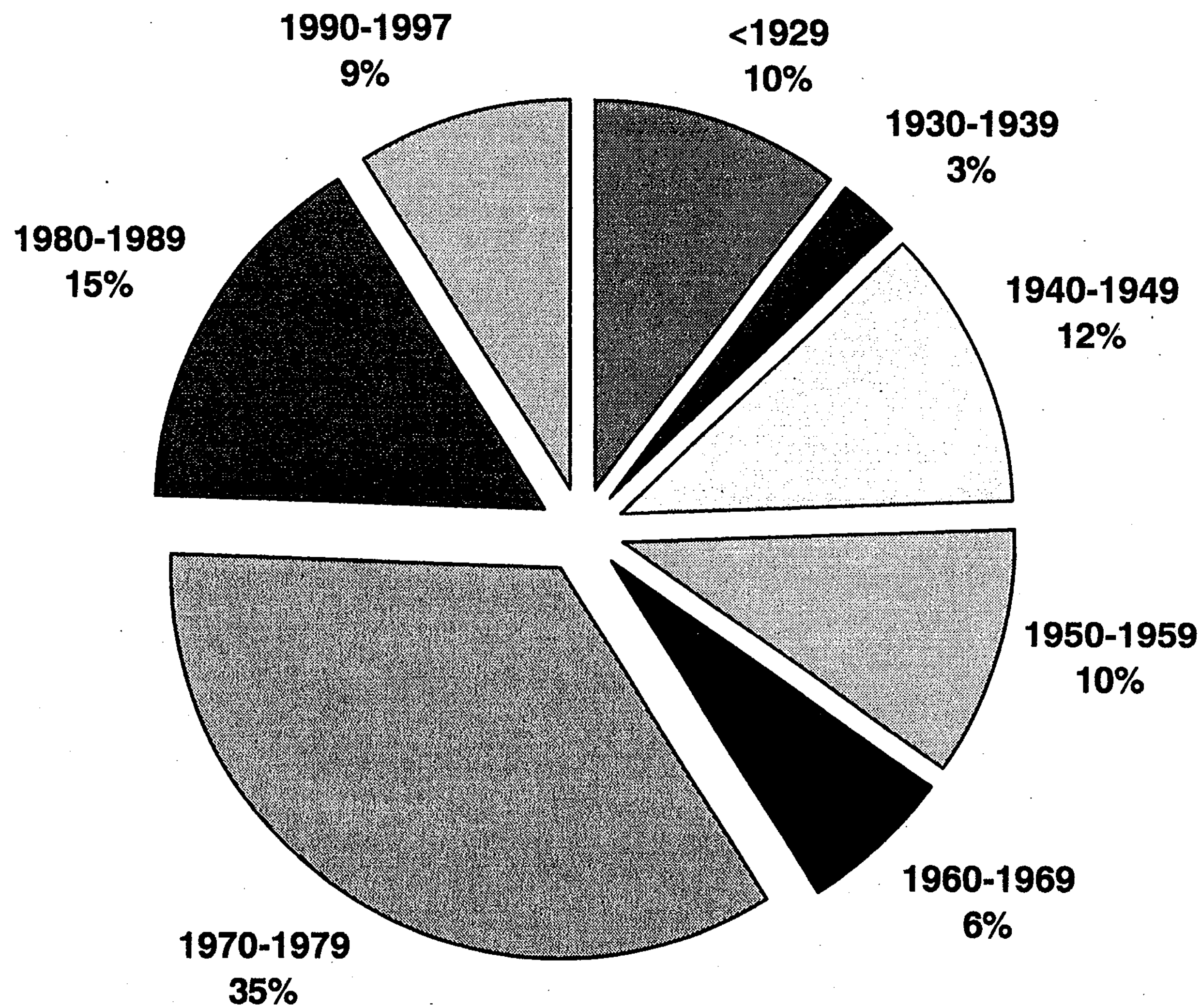
Hr/yr

- 7630 average
- 8400 median
- 2035 standard deviation

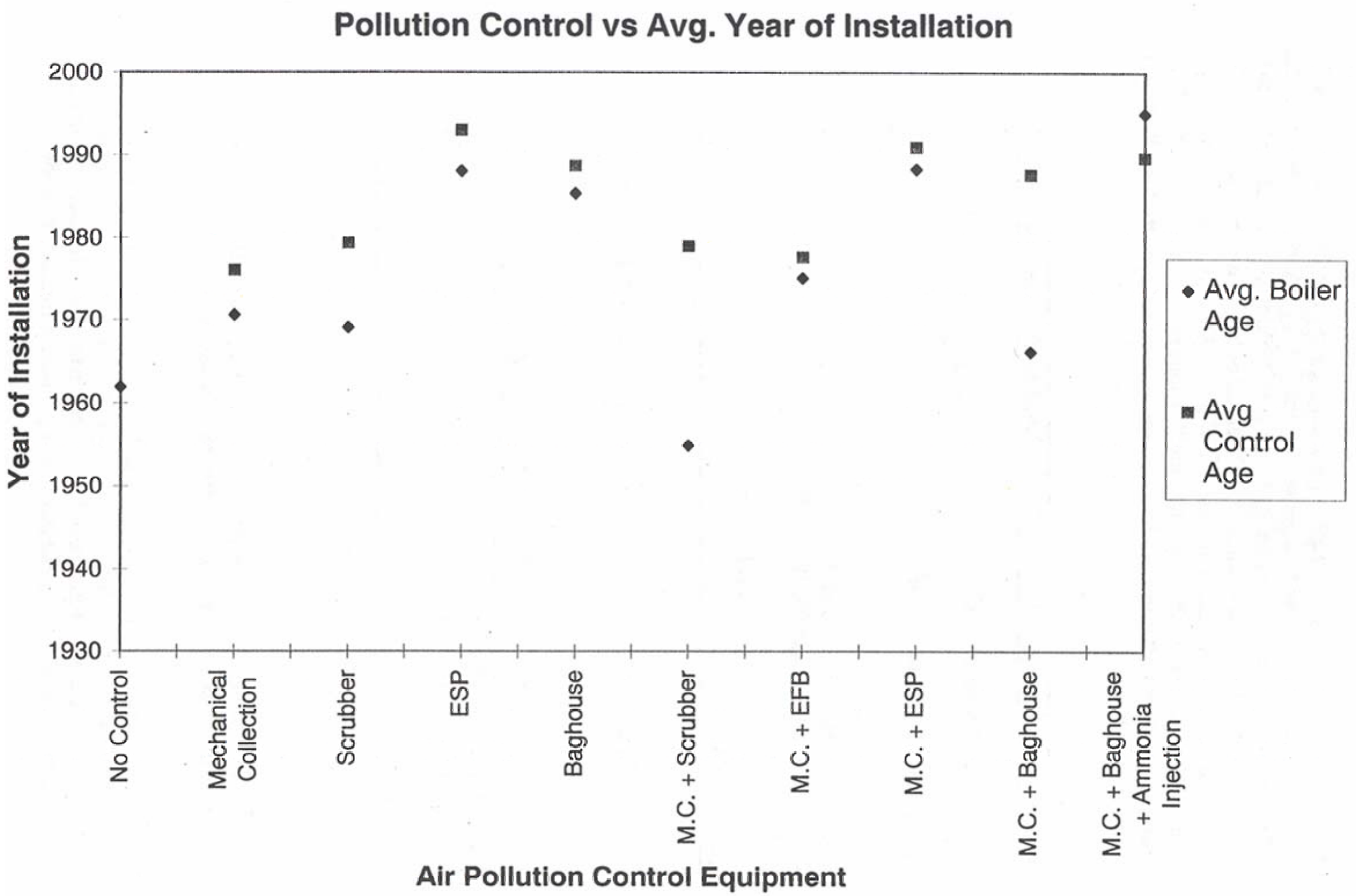
FlyAsh/Char Reinjection

One practice that has been surveyed is the practice of flyash or char reinjection. Flyash/char reinjection is the practice in which large particles collected by pollution control equipment are returned into the combustion chamber. This poses significant

Age of Wood Waste Boilers



Graph 10


Pollution Control vs Avg. Year of Installation
Year of Installation
2000
1990
1980
1970
1960
1950
1940
1930
No Control
Mechanical Collection
Scrubber
ESP
Baghouse
M.C. + Scrubber
M.C. + EFB
M.C. + ESP
M.C. + Baghouse
M.C. + Baghouse + Ammonia Injection
Air Pollution Control Equipment
Avg. Boiler Age
Avg Control Age

Graph 11

challenges because it increases the fine particulate loading/concentrations in the flue gas stream. The two reasons why facilities employ this practice are: (i) it increases combustion efficiency by one to four percent; and (ii) it reduces the amount of ash that needs to be disposed (EPA, 1978).' In Washington, 32 percent of boilers use this mechanism. (Note: calculation based on 86 percent reported.) Of these 27 boilers (reported) that reinject their flyash or char, 12 of them operate a multicyclone in series with a scrubber. Thus, the controls with the lowest efficiency for fine particulate removal are the largest users of flyash reinjection.

Table 9

Type of Control Equipment	Number of Boilers that Reinject
No Control	1
Mechanical Collection (M.C.)	5
Scrubber	0
Electrostatic Precipitator (ESP)	0
Baghouse	0
M.C. & Scrubber	12
M.C. & Electrified Filter Bed (EFB)	2
M.C. & Electrostatic Precipitator (ESP)	2
M.C. & Baghouse	1
M.C. & Baghouse & Ammonia Injection	0
Unknown (Not Reported)	12

As shown in table 10, this practice is used evenly by the two major industries.

Table 9

Industry	# of Boilers that Reinject Flyash/Char
Lumber and Wood Products	14
Paper and Allied Products	8
other	1
TOTAL	23

Summary

In summary, segments of the survey analysis that have been characterized as areas of environmental concern or that need further examination are outlined below:

- Control equipment is primarily operated for particulate matter removal. Previously, other pollutants emitted from wood boilers have not been deemed critical for installation of control equipment. In Washington there is a significant population (25 percent) of boilers that operate with a low particulate control efficiency.

- The combustion of salt-laden wood affects the characteristics of the emissions from a wood fired boiler. Fine particulate matter emissions (less than one micron) and plume opacity increase with the use of salt-laden wood. The formation of chlorinated compounds also increases with the combustion of salt-laden wood.

- The practice of flyash/char reinjection increases the fine particulate concentrations entering the control equipment. This usually results in increases in both fine particulate emissions and in the erosion potential in the control equipment.
- The age of boilers and control equipment influences their efficiency. Currently, the average boiler operates 15-year-old equipment.
- Wood fuels are no longer the only major fuel used by a segment of the boilers in Washington. Each fuel has a different emission potential. Controls for pollutants other than particulate matter are not being used even when these "other" fuels supply a larger heat input than wood fuels.
- Lastly, the evaluation of combustion operation in most boilers in Washington is dependent on the skill or knowledge of the operator. Continuous emission monitors (CEMs) are only found on the large boilers. A carbon monoxide monitor would provide operators with valuable information about the completeness of combustion, which could increase combustion efficiency while reducing the emission of hazardous air pollutants.

Conclusion

After analyzing the data obtained from the wood waste boiler survey, it becomes apparent that a RACT evaluation should proceed. Additionally, a rule review should be done to clarify any confusion over the proper classification in Washington Administrative Codes (WACs).

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Appendix A - Literature Research

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Appendix B - Sample Form

HOG FUEL BOILERS — ABC MANUFACTURERS

Plant name:	ABC MANUFACTURERS
Contact:	TOM SMITH
SIC code:	2421
Agency code:	C
FIPS Code:	053
Source Number:	0001
Point Number:	01
Number of HFBs:	1
Are they one point source?:	

Boiler Operation:

Hr/da:	24
Da/wk:	5
Wk/yr:	50

Plant address:	1000 1ST AVENUE
City name:	ANYWHERE
Zip code 5:	98989
Telephone Number:	(206) 555-5555
Mail address:	PO BOX 1000
Mail city:	ANYWHERE
Mail zip 5:	98989

Notes: Any special information unique to boiler. Examples: Types of Monitors (ie - Continuous Opacity Monitor, CEM for CO, NOx, ...), Boiler Efficiency

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HOG FUEL BOILERS

ABC MANUFACTURERS

Design #1:	Spreader Stocker, Dutch Oven or Fuel C
Model #1:	CE-VO-30
Description HFB #1:	water tube/ fire tube, type of grate
Age of HFB #1:	1975
Manufacturer HFB #1:	Babcock and Wilcox
Design #2:	N/A
Model #2:	N/A
Description HFB #2:	N/A
Age of HFB #2:	
Manufacturer HFB #2:	N/A
Emission controls #1:	Multicylcone
#2:	Scrubber, Wet
#3:	None
Model Number #1:	MSTA-180
Model Number #2:	Doyle type
Model Number #3:	N/A
Manufacturer #1:	Zurn
M2:	Mirkropul
M3:	N/A
Year of Installation #1:	1975
A2:	1975
A3:	

Design Steam Capacity (lb steam/hr):	80000
Design Steam Capacity (MMBtu/hr):	96
Design Temperature Out (F):	1200
Design Pressure Out (psig):	450
Underfire/Overfire Air Temperature (F):	500
Feed Water Temperature (F):	300
Actual Firing Rate (lb steam/hr):	60000
Actual Firing Rate (MMBtu/hr):	72
Actual Pressure Out (psig):	400
Actual Temperture Out (F):	800

Fuels Used 1:	Hog fuel - sawdust, shavings and other wood waste
2:	Natural Gas
3:	sludge
4:	No. 6 fuel oil for start up
5:	

Amount of Fuel Used 1:	50000	tons/year
Amount of Fuel Used 2:	1500	MMft3/year
Amount of Fuel Used 3:	7000	tons/year
Amount of Fuel Used 4:	2	1000 gallons/year
Amount of Fuel Used 5:		

Salt-laden Wood (Yes/No):	Yes
Percent of Wood Fuel that is Salt-laden (%):	35
Flyash Reinjection (Yes/No):	Yes

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