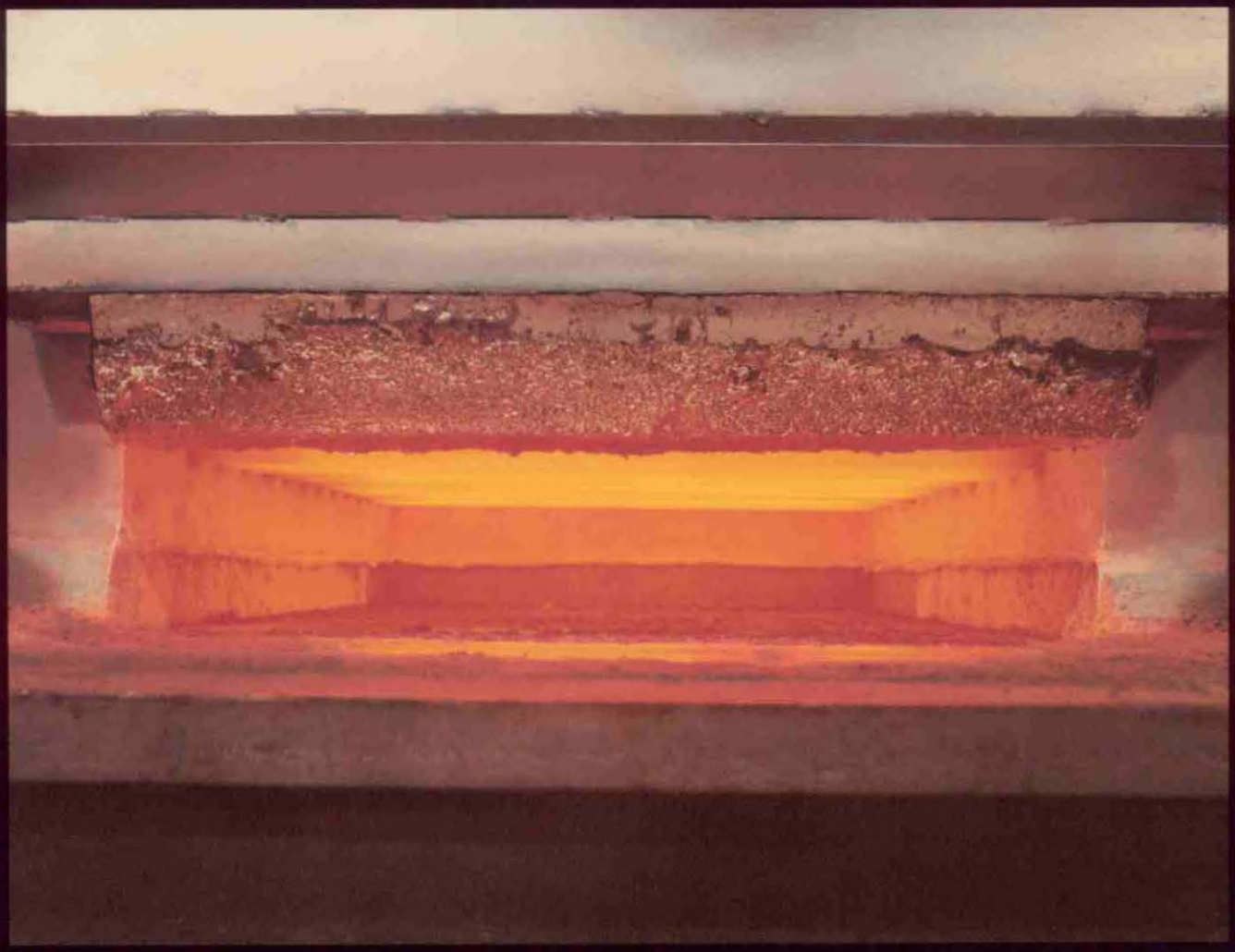


Furnaces for melting and holding aluminum

FWS INC.

Your experienced production partner

No other aluminum furnace builder has more experience than Frank W. Schaefer in the systems approach to high quality aluminum delivery. Veteran teams of specialists design, manufacture, install and service every FWS furnace, whether it's fired by fossil fuel, electricity or both.

Beyond the basics

We know how to improve your metal quality and melting efficiency with advanced designs, filtration, degassing, regeneration, recuperation, recirculation and heated launder systems. And we will work with you to develop a comprehensive plan for melting, holding and material transfer.

The whole ball of wax

How complete do you want the installation service? You choose. Every FWS furnace — from the smallest to a 200,000 lb melter — can come to you on a turn-key basis. With the total service option, each furnace is completely piped, wired, installed, started and supplied with well covers, clean-out tools, service manuals and staff training.

Service that maintains your production

You can rely on technical service assistance 24 hours a day, 365 days a year. Add one of the industry's largest inventories of furnace parts, and you'll see why Schaefer sets the standard for service.

"Hitting the numbers"

FWS furnaces have an unmatched record of melting to their rated capacity. An FWS furnace rated at 1,000 lb/hr will deliver at least that amount consistently. And when FWS talks efficiency numbers — naming a specific amount of gas or electricity per pound of metal melted — you can count on hitting those numbers every day.

Schaefer leadership milestones since 1945

- Pioneering radiant roof gas-fired reverberatory furnaces
- Inventing the radiant electric reverberatory aluminum melting furnace and supplying the vast majority of all such units in use today
- Leading the industry in applying molten metal filtration and degassing systems for a continuous flow of clean, high quality molten aluminum — the first step in obtaining quality castings
- Being one of the first manufacturers to use high velocity and high momentum combustion equipment
- Designing and building the first aluminum furnace with ultra-efficient regenerative combustion equipment, then repeating this success more often than any other aluminum furnace manufacturer.

Radiant roof central melters with 1,500 and 4,000 lb/hr ratings

Two 1,500 lb/hr gas-fired aluminum melting reverberatory furnaces

Use these numbers to help evaluate your furnace needs

Energy generated

- Natural gas: 1,000 BTU/CF
- Propane: 92,000 BTU/gal in liquid form
- #2 fuel oil: 138,000 BTU/gal
- Electric: 3,412 BTU/KW

Efficiency per pound of metal melted

- Gas crucible or pot type: 3 to 4 CF gas/lb
- Electric crucible or pot type: .20 to .25 KW/lb
- Gas dry hearth: 2 CF gas/lb
- Gas reverberatory wet bath: 1.5 CF gas/lb with 100% cold charging in exterior well or 1.2 CF gas/lb with 50% preheating of ingots or sows (in FWS furnaces) ... lower with heat recuperation and regeneration and molten metal recirculation
- Electric reverberatory: .20 to .23 KW/lb (in FWS furnace)
- Electric induction: .22 to .27 KW/lb

When demand for an alloy reaches 500 to 600 lb/hr, consider the higher melting efficiencies of a central melting furnace.

Typical metal melting loss:

- Electric reverberatory: less than 1% (in FWS furnace)
- Wet bath fossil fuel reverberatory: 3 to 5%
- Crucible or pot type: 3 to 7%
- Dry hearth with 50% scrap: 5 to 12%

Redesign and rebuilding

Upgrading older furnaces to today's standards — from a basic relining to a major design modification — is also a Schaefer specialty. We can apply current technology to modernize your older furnaces (from FWS or any other manufacturer) and provide higher efficiency, improved metal quality and greater ease of use.

Whether we do the redesign and rebuilding in our factory or on your premises, you'll get the same level of quality construction that goes into a new FWS furnace. This may offer a lower cost alternative to replacement. And, if you're uncertain about whether to rebuild or replace, we'll be happy to do an on-site furnace inspection and evaluation.

Customer support

After we install your furnace, we'll teach your staff how to use it and take care of it.

But that's just the beginning. It's also part of our job to help keep you up and running. That's why we maintain such a strong parts inventory ... and why we offer around-the-clock technical advice and immediate response to your service requests.

10,000 lb/hr melter with 80,000 lb hold capacity and regenerative burners in final factory assembly at the FWS facility

Welding structural components at FWS

FWS' extensive in-plant inventory includes controls, gas combustion components, electric elements, thermocouples, crucibles and hundreds of other parts

Electric wet bath reverberatory furnaces

1,200 lb/hr furnace in sand foundry

Highly efficient electric reverberatory melting furnaces provide the best quality metal. They have an extremely low metal melt loss. And they have very low maintenance requirements.

Ever since Schaefer designed, built and installed the world's first one in 1974, the radiant electric reverb has become many melters' first choice for the low cost production of clean molten aluminum. Approximately eighty-five percent of the electric reverb furnaces working today carry the FWS nameplate.

Versatility — These production melters meet the needs of a variety of metal casters, high and low pressure die casters, and permanent mold, sand, investment and plaster mold foundries all across the country.

Melting — Silicon carbide resistance elements transfer radiant heat to the work load to melt metal with only .20 to .23 KWH per pound. You can even melt efficiently from a cold start. A full-proportioning control system delivers accurate energy flow. Melt loss is usually less than 1%, and that alone can give you a one-year return on investment.

Metal quality — Electric wet bath reverbs deliver the finest metal quality from ingot or scrap. No combustion means no metal gassing. And a conservatively sized tranquil bath eliminates oxide-creating metal turbulence. If you need the highest metal quality, ask us about filtration and other processes that will deliver exact metal grades.

Operating comfort — FWS electric reverbs are quiet. They don't put out hot flue gases to heat up the environment. And their cleaner heat means a cleaner work space.

These furnaces need less cleaning and fluxing, too, so you also save on labor, time and trouble.

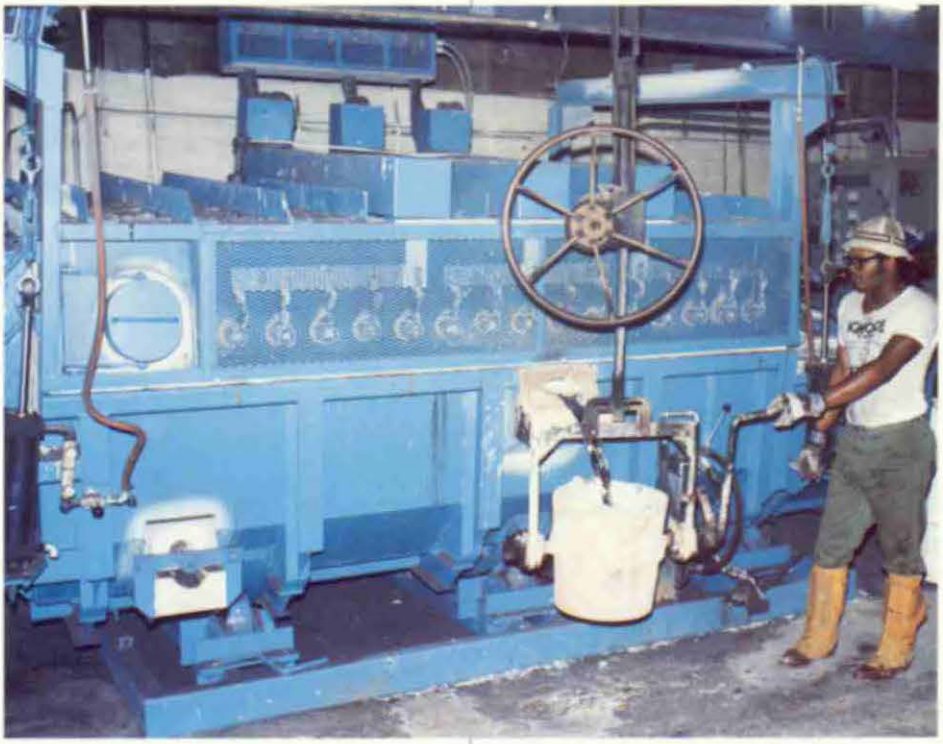
Typical furnace sizes

Lb/Hr Melt Rate	Length	Width	Height
400	8'-6"	5'-7"	6'-0"
600	11'-0"	6'-0"	6'-0"
800	12'-6"	6'-9"	6'-6"
1,000	14'-9"	7'-3"	7'-0"
1,200	15'-3"	8'-3"	7'-0"
1,500	15'-3"	9'-3"	7'-0"
2,000	17'-6"	9'-3"	7'-0"
3,000	22'-0"	9'-3"	7'-0"

Other sizes and configurations available.

Automated operation

Schaefer can design and apply automatic and semi-automatic accessory equipment to upgrade your furnace operation and improve safety. Choose from sow and ingot charging devices or scrap charging and furnace cleaning equipment. Additional options include robotic ladling, mechanical or air pressure molten metal discharge pumping, automatic metal level controls in metal transfer systems and tilt discharge.



Pouring from tilt-type
1,000 lb/hr electric reverb

400 lb/hr electric reverb in
Australian die cast foundry

Typical furnace sizes/ configurations

Lb/Hr Melt Rate	Length	Width	Height
250	7'-9"	6'-2"	6'-0"
500	9'-6"	6'-6"	5'-8"
1,000	12'-1"	7'-9"	5'-10"
1,500	14'-2"	10'-6"	5'-11"
2,000	16'-3"	11'-6"	6'-9"
3,000	17'-4"	12'-0"	7'-0"
4,000	18'-7"	17'-0"	8'-10"
6,000	22'-6"	18'-0"	9'-0"

Other configurations and in-between sizes up to 20,000 lb/hr melt rate are also available.

2,500 lb/hr central melt furnace with regenerative burners and heated launder

This 2,500 lb/hr gas reverb is used by a wheel manufacturer

1,500 lb/hr gas-fired reverberatory melter with clean-out door open

Dry hearth furnaces

Gas...Oil...Propane

We design these furnaces mainly to melt aluminum ingot and sows. With no gassing or contamination by the lining, metal purity remains high. Impurities and the oxide skin stay on the hearth. Only molten aluminum enters the hold zone.

Melting — Fuel consumption is a modest 2.0 CF of gas per pound of melted aluminum, thanks to the highly efficient radiant roof; this number drops even farther with high velocity burners. A two-zone control offers the closest temperature control possible.

Easy maintenance — Charge and clean-out doors are tangent with the side walls for cleaning access. A double hinged or full width clean-out door makes complete access to the hold zone simple.

Tilt-type dry hearth furnace for an automotive foundry

Typical furnace sizes/ configurations

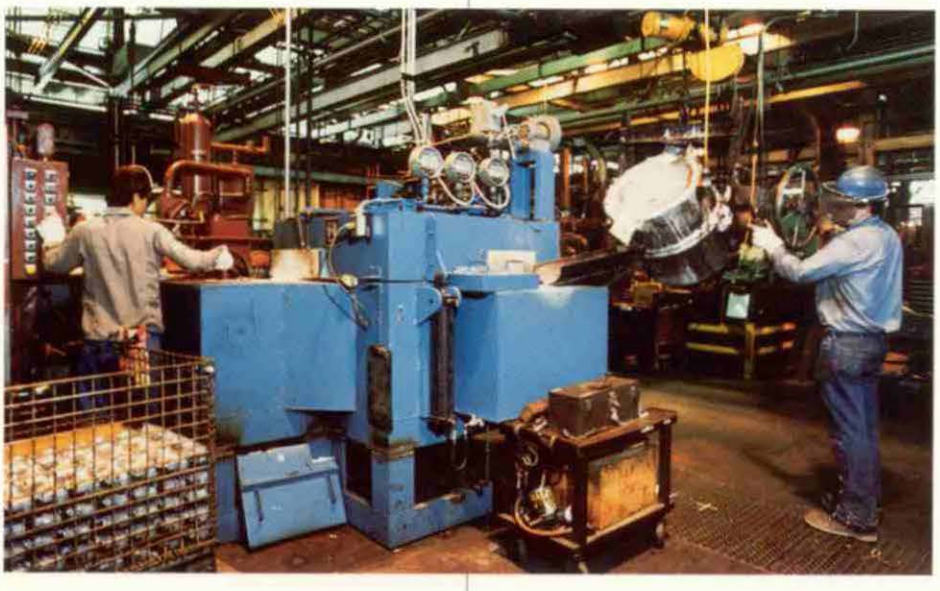
Lb/Hr Melt Rate	Length	Width	Height
300	7'-9"	4'-4"	8'-1"
450	8'-0"	4'-8"	8'-1"
500	8'-0"	7'-6"	8'-9"
600	8'-5"	8'-0"	8'-9"
800	9'-3"	8'-0"	8'-9"
1,000	9'-9"	8'-6"	9'-3"
2,000	14'-0"	7'-0"	10'-0"
4,000	16'-0"	10'-0"	10'-6"

Note that both single and double dip stations are available. Other sizes and configurations are also available.

Low energy wet bath holding furnaces

Robot serves electric low energy wet bath holder with a right angle dip well

Gas-fired low energy holding furnace



Electric or Gas-fired

A 2,000 pound FWS electric holding furnace will maintain a temperature of 1,300° for only 3 KW/hr with well covers on. You get similar savings in all capacities, from 1,500 to 30,000 pounds.

We offer a choice of ni-chrome or silicon carbide heating elements. Ni-chrome lets you use a lower-cost control system; silicon carbide handles higher watt loads for more compact furnaces.

If you prefer to use gas, you can hold those 2,000 pounds at 1,300° with 50 to 60 CF gas/hr. We can also supply a dual energy option that lets you convert between electricity and gas to use the lower cost source.

Lining — We offer a choice of either monolithic or board lining systems. Our rugged, thermally efficient, non-wetting lining lets us put the hot metal well anywhere you want it. And we can make it square or rectangular, straight or offset at special angles, even with sloped ends for robot ladling and other automation equipment. The lining also helps keep the casing temperature low.

Options — A power-operated tilt lid lets you clean the furnace in less than 10 minutes. And we can supply full-proportioning, solid-state microprocessor controls and specially designed heating elements with a proven record of superior service life.

Typical furnace sizes/ configurations

Approx. Hold Cap.	Length	Width	Height
1,500	9'-0"	4'-1"	4'-2"
2,000	9'-0"	4'-1"	4'-5"
3,000	9'-9"	4'-7"	4'-6"
4,000	9'-11"	4'-7"	4'-11"
5,000	10'-5"	4'-7"	5'-2"

Other sizes, configurations and well sizes are available.

Crucible and pot-type furnaces

Electric crucibles

Melting or holding, these popular furnaces deliver exceptional efficiency. With covers on, they use only .20 to .25 KW/hr per pound to melt cold metal and just 3 to 4 KW/hr to hold 1,000 pounds of molten aluminum at 1,220°F. Electric crucibles use less energy than channel-type induction furnaces, and they provide more accurate temperature control. Both manual and power-operated tilt-type versions are also available.

Compact — Note the sizes in the table. They take up very little floor space and are ideal for tight spots. Small space requirements make this crucible a perfect partner in a complete system of FWS furnaces around die casting machines or in permanent mold and sand foundries.

Lining — High-temperature ceramic fiber lines walls, floor and top for excellent insulation, low heat storage and low maintenance. It can't be thermal shocked, so you can rapidly bring it on line or take it off. This also means the furnace is cool and quiet to work around.

Controls — A reliable, solid-state, full-proportioning control system continuously meters in only the amount of power required at any given time. A built-in leak detector sounds an alarm if the silicon carbide crucible should ever leak.

Easy installation and maintenance — You can connect the straight resistive electrical load in either single or three phase primary electric service. Solid state controls reduce maintenance and maintain very close temperature control. If necessary, you can replace the crucible in one or two hours while the furnace remains in place.

Long service life — Depending on the ratio of melting to holding time, the silicon carbide crucible will outlast those in gas and oil-fired furnaces. The heavy duty electrical resistance heating elements usually deliver one to five years of service, and the lining will last even longer.

Typical FWS electric crucible with power operated cover before crucible installation

Heating elements of electric crucibles have long service life

Gas, oil or propane crucible or pot furnaces

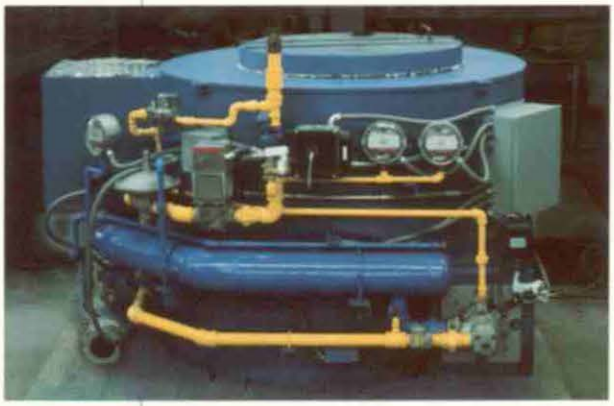
You can also specify fossil fuel-fired crucibles with many of the same features as the electric models: ceramic fiber lining, exceptional long life, compactness, comfort, low maintenance and easy installation.

Gas models require only 3 CF of gas (3,000 BTU) or less per pound of metal melted, and other models have the same kind of efficiency. Our unique single or triple fossil fuel firing and fluing capabilities mean great performance. Close temperature control, rapid melting and leak detectors are all features that enhance the cost effectiveness of these furnaces.

Typical sizes

Approx. Hold Cap.	Length	Width
400	4'	2'-10"
600	4'	3'-2"
800	4'-10"	3'-4"
1,000	4'-10"	3'-4"
2,000	5'-6"	4'-4"

Other capacities are available to meet your specific needs.



An automotive research center depends on this 1,200 lb gas crucible

Filtration and degassing systems deliver highest quality metal

The demand for higher quality aluminum — used in production quantities to cast such things as aircraft and automotive parts, critical computer parts, can stock and bright trim — keeps growing. By filtering out the various inclusions, you eliminate flaws, voids and brittle planes of fracture. At the same time, the metal acquires increased fluidity, plus greater strength and ductility, improved machinability and better surface finish. All of which contributes to reduced tool wear, fewer rejects and less rework.

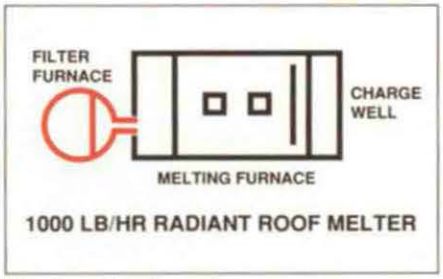
The best metal cleaning systems also remove hydrogen, the only gas soluble in molten aluminum. Hydrogen gas lowers a casting's specific gravity and creates porosity. Porosity lowers the fatigue resistance of stressed parts, causes leakage under pressure, decreases corrosion resistance, and reduces tensile and yield strength.

Even if you need only batch runs of filtered/degassed metal instead of continuous production, this higher quality metal offers major benefits in today's competitive marketplace.

Experience — Among all furnace manufacturers, Schaefer is a pioneer in metal cleaning systems, offering the most design and installation experience. We use a variety of filtration media, each chosen to meet a specific need, including filter plates, filter tubes, filter beds and sparging gases. Porous plug technology, rotary sparging gas nozzles and degassing lances can also be efficiently applied.

Design — The basic FWS concept connects a highly efficient wet bath reverberatory melting furnace with a specially designed filter furnace. The reverb provides low melt loss and high volume; the filter furnace delivers high quality, clean metal with very close and stable temperature control. Both furnace types can operate on the energy source you prefer. (See plan view of filtration system in the center of this page.)

Filtration and degassing provide cleaner metal in an automated lost foam foundry



Plan view of filtration system

Crucible type filter furnace is interconnected to an efficient reverb melting furnace

60,000 lb aluminum holding furnace with porous plug degassing system

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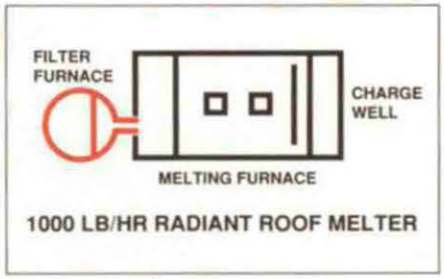

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60,000 lb aluminum holding furnace with porous plug degassing system

The ultimate molten metal delivery system

Heated launder systems

The most technically advanced way to deliver molten aluminum from melting furnaces to holders and die casting machines is in a heated launder system. Let us put our extensive experience in designing and installing launders to work for you.

Examples: Schaefer recently installed almost 300 feet of launder at one of the most modern aluminum foundries in the U.S. to serve an array of FWS melting, holding and filtration/degassing furnaces. Another 270 foot launder serves six vertical die cast machines and three central melt furnaces. Still another runs 110 feet from a filter furnace to the first 10 of what will be 24 interconnected holding furnaces when the installation is complete.

We have both the technology and the imaginative designs to meet your needs. Our launders are well sealed, highly insulated and easy to clean ... because they were engineered to stay clean.

A launder minimizes turbulence and oxides in the molten metal. And, because the metal flows in a quiet stream to the holding furnace, it eliminates transfer labor and monorails, fork trucks and bull ladles. It automatically delivers the exact amount of metal you need — on time and at temperature. Very little energy is required.

Launder systems aren't the answer for everyone. They must be carefully considered, because they can reduce the flexibility of your plant layout. But they can be very cost-effective in the right application.

300 feet of heated launder helps automate this die cast foundry

Other products

Dual energy furnaces — You can order this option for the maximum in energy flexibility. We'll supply your furnace with either electric elements or gas (or oil or propane) combustion systems. Then — to meet an emergency situation or counter a major change in energy rates — you can easily convert to the other fuel in less than two hours.

Launder system delivers molten metal to a holding furnace

Heat treating furnaces — We can apply the same technology and experience that make Schaefer a world leader in melting and holding furnaces to heat treating furnaces. Ask us for details.

Energy management systems — One of these can control your peak demand loads and surcharges without affecting your production schedules. A system can help you monitor your energy use and rank your energy needs with little training or programming expense.

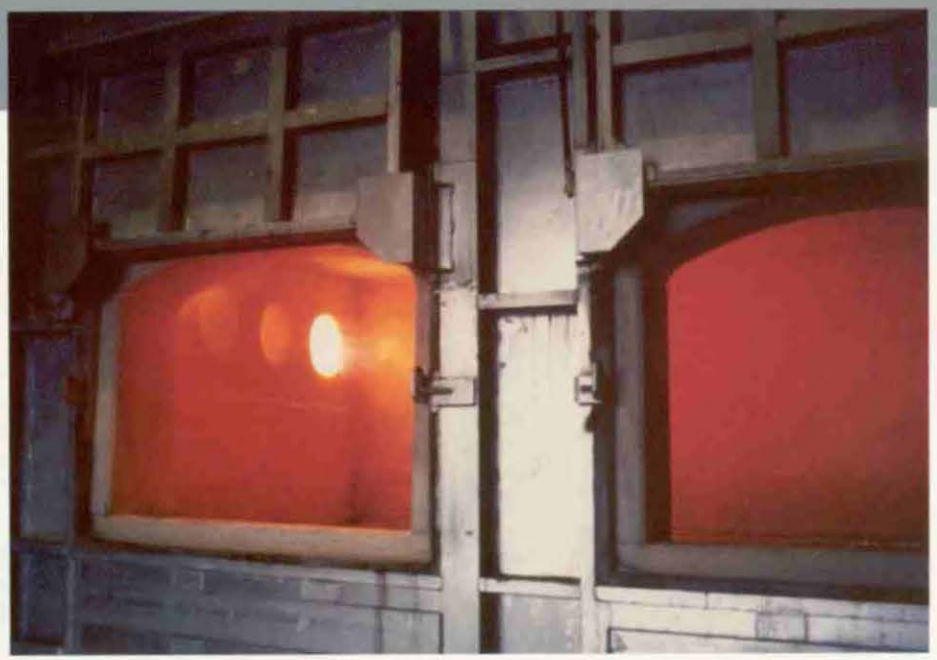
FWS not only knows furnaces, but we can also supply ladles and ladle relinings, along with technical inspections and evaluations of your melting and holding operation. When it comes to hot metal, we can help you handle it.

Why choose FWS?

When you select a furnace supplier, your first step may be to ask others in your industry for recommendations. If they've ever used an FWS furnace, you'll hear that name first. Why? Because Schaefer:

- invented, pioneered and developed a variety of furnace innovations and improvements,
- sells and services the most complete line of melting and holding furnaces,
- leads the industry in applying high quality metal systems — filtration, degassing and the latest in combustion equipment,
- delivers the rated furnace capacity every time,
- redesigns and rebuilds older furnaces to meet today's higher standards,
- operates furnaces efficiently on all energy sources with extremely low melt loss, and
- has set the time-proven performance standards for furnace quality and design.

Looking inside a 175,000 lb central melt furnace with regenerative burners



4,200 lb/hr central melt furnace in an automotive die cast foundry

FRANK W. SCHAEFER, INC.

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You'll also find sales representatives throughout the U.S. and Canada, with licensed manufacturers in other countries. Contact Schaefer headquarters for details.