



Gasifier

Proven technology to process multiple feedstocks

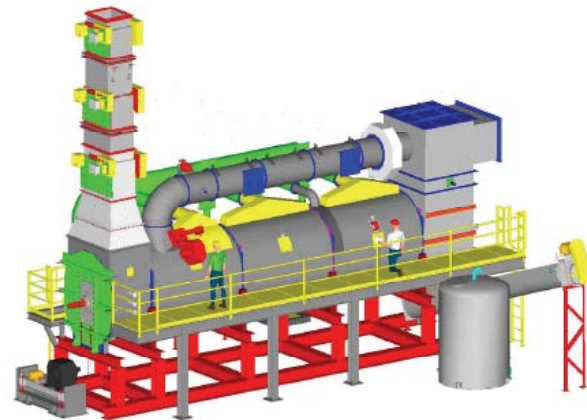
ICM's proven gasification technology was developed in the early 1980s and was successfully tested and supported at rates up to 250 TPD by the Department of Energy.

Our three commercial-scale unit designs will operate nominally at 150, 300 or 450 tons/day rates (peak rates will depend on the actual feedstock composition and characteristics). All models are capable of handling multiple feedstocks. Typical fuels or fuel blends could include:

- Refuse Derived Fuel (RDF) from Municipal Solid Waste (MSW)
- RDF blended with Tire Derived Fuel (TDF)
- Wood chips and bark
- Agricultural residue
 - Corn stover and cobs
 - Rice straw or wheat straw
 - Oat hulls
 - Bran
- Energy Crops
- Urban trimmings
- Construction & Demolition waste (C&D)
- Bio-refining residue
- Sugar cane bagasse
- Poultry litter
- Biosolids
- Paper sludge

How it works

Gasification is a process that heats and converts carbon-based feedstocks into a combustible fuel comprised largely of carbon monoxide and hydrogen. In the ICM gasifier, a limited amount of air is used to partially combust the fuel. The heat generated breaks down the remaining feedstock to form a gas, commonly called syngas or producer gas. This highly combustible gas can be readily burned to provide process heat and steam or produce renewable electricity.



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Advantages of ICM Gasification Technology

- **Multiple, non-specific feedstocks with minimal size reduction** – Some gasifiers can only process a specific feedstock with strict size and moisture content limitations. ICM's gasifier comes with fuel flexibility built in. It uses a large, slow-turning auger to move feedstock through a horizontal gasification chamber. This offers the advantage of controlled retention time, allowing the feedstock flow to be slowed down or sped up, depending on needs. Separate air zone stages and a bypass duct provide added control and flexibility, giving ICM gasification technology the ability to process a wide range of different feedstocks, including those with high-moisture content (<45%) and minimal size reduction.
- **Robust, maintenance-friendly design** – With very few moving parts, the ICM gasifier has a low requirement for maintenance, and we can test your feedstock at our commercial-scale 150 TPD demonstration unit to ensure our technology will deliver the results you are expecting.
- **Small footprint** – The footprint for our largest unit is 38' x 14'.
- **Variable energy output** – When combined with a steam boiler, turbine, and generator, our 150 TPD gasifier can produce up to 6 MW of electrical power. Our 450 TPD model can produce up to 18 MW and can be readily configured in multiple trains for larger projects. The ICM gasifier can also easily be integrated in to combine heat and power applications.
- **In-house fabrication** – By fabricating equipment in-house, we are able to maintain a strict quality control chain throughout the entire manufacturing process, ensuring each piece of equipment meets our high quality standards. It also means that when your equipment needs system maintenance in the years to come, the same people who built and installed your equipment will be on hand to travel to your facility to service it. Shop fabrication of the gasifier's modular components also minimizes risk of construction cost overruns and delays. This modular construction allows for easy truck/rail/barge transport to your site, and it provides significant cost advantage over site-built systems.
- **Customer Service** – ICM engineers, builds, installs, and supports our equipment, including providing startup and O&M services.
- **Carbon sequestration** – The ICM gasifier is capable of generating a high-carbon char co-product that can also be used as a beneficial soil amendment as well as a resource for carbon sequestration.



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IN DEVELOPMENT:

ICM has installed and is testing a pre-combustion syngas cleanup process to our Newton, Kansas, demonstration facility. The clean syngas can be used to re-power existing coal boilers. The benefit to existing coal boilers is that the syngas generated from renewable biomass and RDF fuels can be scrubbed to remove alkalis, and chlorine prior to combustion in existing boiler assets.

Industrial applications for gasification technology in new and existing plants and brown-field retrofits:

- Municipal solid waste conversion to renewable energy
- Coal boiler re-powering
- Pulp and paper mills
- Food processors
- Pellet plants
- Poultry processing facilities
- Timber mills
- Panel board plants
- Independent power producers
- Biorefineries, including traditional corn-to-ethanol and cellulosic ethanol plants

- **Best Available Control Technology (BACT)** – Our gasification technology package, when used with a Wet ElectroStatic Precipitator (WESP) for emission abatement, is capable of removing a wide variety of pollutants, including sub-micron particulate, acid gases, NOx, and elemental mercury -- meeting LAER standards in most situations.

Cleaner, more energy efficient, and more flexible than combustion

ICM recommends that our customers seriously consider gasification as an alternative to combustion, as we believe it is the better option for most applications.

Gasification (as compared to traditional combustion)	Benefits
Greater flexibility and control in maximizing the utilization of the chemical energy of biomass fuel	<ul style="list-style-type: none"> • Combustion produces heat only • Gasification allows owners to re-power existing infrastructure while creating valuable co-products. Possibilities include: <ul style="list-style-type: none"> ☐ Cooling ☐ Heat Recovery ☐ Steam ☐ Power ☐ Combined Heat and Power (CHP) ☐ Biochar Production
Flexible co-products	<ul style="list-style-type: none"> • Gasification can be controlled to produce char with varying carbon contents, depending on desired result, allowing use as a soil amendment and for carbon sequestration
Provides a cleaner alternative	<ul style="list-style-type: none"> • The ICM gasifier operates at lower temperatures (<1300° F vs. +2000° F) when compared to traditional combustion processes, reducing the potential to volatilize particulate emissions • ICM has extensive design experience with thermal oxidation and has formed a strategic alliance with a leading emissions control technology provider
Lower operating temperature	<ul style="list-style-type: none"> • Greater feedstock flexibility (i.e., agricultural residues)

Contact us for more information, or to schedule a tour of demonstration facility

Learn more about this and other ICM technology by calling our Business Development department today.

316.977.6834



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