

The ECOLOTEC process for clean and rapid production of core and molds

Introduction

Long recognized for performance advantages that include high strength levels, rapid production rates, excellent post-casting shakeout, dimensional accuracy, and world-class casting quality, organic resin gas-cured binder systems have been a *standard* in the metal casting industry since the 1970s. However, the *conventional* organic resin binder processes in prevalent use have presented some significant disadvantages to users.

For example, the gas-cured phenolic/urethane amine system contains a high level of free phenol (typically, 5% or greater), has an extremely noxious odor in use, requires use of a curing gas scrubber to remove

unwanted lustrous carbon formation on casting surfaces, nitrogen pinholing, and veining defects.

The phenolic-ester methyl formate gas-cured system, seen by many as a relatively clean organic gas-cured coremaking process, actually has a significant shortcoming in the area of environment. While this process uses a water-based phenol-formaldehyde binder, the curing gas required is highly-flammable and toxic vaporized methyl formate.

With the advent of the ECOLOTEC process, foundrymen have an 'environment-friendly' alternative core and moldmaking process that overcomes the environmental, performance, and casting quality deficiencies associated with the *conventional* organic gas-cured systems available. The ECOLOTEC process is virtually odorless in use, contains no flammable components, and is gas-cured with safe CO₂ (carbon dioxide) gas.

Introduced to the North American market in 1989, the ECOLOTEC process has been chosen by foundries casting gray and ductile iron, steel, and non-ferrous alloys. Both high-production and jobbing shops use cores and molds made by the ECOLOTEC process to manufacture castings having the most stringent quality requirements. These foundries know that, in addition to improving environment and casting quality, the *overall* costs associated with the use of the ECOLOTEC process are the lowest of any organic gas-cured core or moldmaking process in use.

Description

The ECOLOTEC process features a proprietary water-based alkaline phenolic resin, known as ECOLOTEC binder. Contained in ECOLOTEC binder is a special 'activator' that is chemically bound within a stable complex. When safe and odorless CO₂ gas is directed through the mixed sand, rapid curing of the ECOLOTEC binder occurs. The resultant core is strong, dimensionally-accurate, and ready to use in the casting process. No auxiliary sand additives are required. Often, no core or mold coatings are needed.



Figure 1.

dangerous fumes, and uses three highly-flammable liquid components. Tooling and mixing equipment must be cleaned with harsh cleaning solvents to remove tenacious residues. Furthermore, this system poses potential metallurgical problems that include

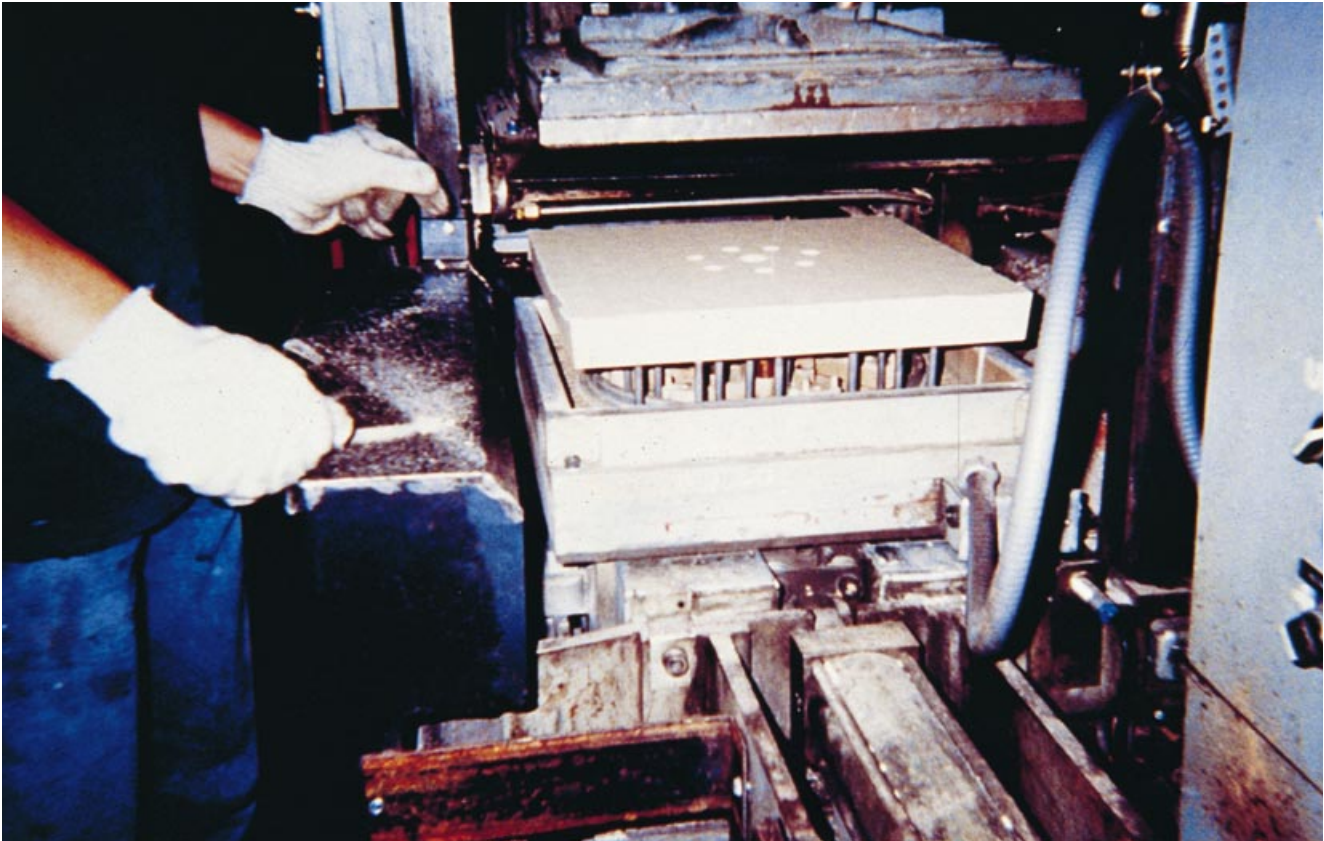


Figure 2.

Examples

Figure 1 illustrates cores made via the ECOLOTEC process and coated with HOLCOTE 578 water-based zircon coating from Foseco. These cores are used in the high-production casting of a critical carbon steel component used in the manufacture of rail transportation equipment. Cores were produced on a high-volume coreblower, dip-coated, and passed through a high-velocity forced warm-air convection drying oven. ECOLOTEC process cores remain strong throughout the casting operation. Core shakeout is good, as expected with an organic resin binder system. Castings produced have consistent dimensions and excellent surface quality.

Figure 2 shows a thin stack mold made in the ECOLOTEC process. The ECOLOTEC process replaced a phenolic-ester methyl formate gas-cured binder system, resulting in a cleaner and safer operating environment in the foundry. Mold production rates were improved, and the very high level of casting quality required was maintained. Furthermore, foundry operating costs were reduced.

Conclusion

After more than six years in use in the North American market, the ECOLOTEC process continues to be a proven gas-cured binder system. High-production and jobbing foundries rely upon the ECOLOTEC process to meet core and moldmaking requirements for their most critical casting applications.

Clearly, the need for environmental performance improvement remains a key incentive for foundries to use the ECOLOTEC process. However, the added benefits of consistent high quality of castings and the reduction of *overall* costs as the result of using the ECOLOTEC process easily justify the foundry industry's keen interest in this leading-edge technology.

Consistent with Foseco's commitment to continuous improvement, the North American foundry industry is already operating with the '4th generation' of ECOLOTEC binder. Foseco research and development activities continue, and the next generation of further-improved ECOLOTEC binder can be seen on the horizon.

For more details about the ECOLOTEC process, please contact your Foseco representative.

*The ECOLOTEC process is covered by one or more of the following US patents: 4,977,209; 4,985,489; 5,162,393.

Advantages/benefits

- Extremely low level of free phenol (0.05% maximum).
- Low level of free formaldehyde (0.1% typical).
- Contains no isocyanates, amines, peroxides or heavy metals.
- No flammable components – improved in-plant safety.
- No curing gas scrubber system required.
- Virtually odorless in use.
- Tooling and mixing equipment can be cleaned easily with only water – no harsh cleaning solvents required.
- Easier process control – only one binder component; no auxiliary additives required.
- Elimination of veining defects from casting surfaces.
- Reduction or elimination of burn-in, burn-on, and penetration defects.
- No potential for pickup of unwanted nitrogen, sulfur, or phosphorous in castings.
- Very low potential for carbon pickup on casting surfaces.
- Low level of gas evolution from cores or molds.
- Compatible with all ferrous metals, copper-based alloys, and aluminum.
- Can be used with water-based coatings.
- Extremely cost-effective in use.