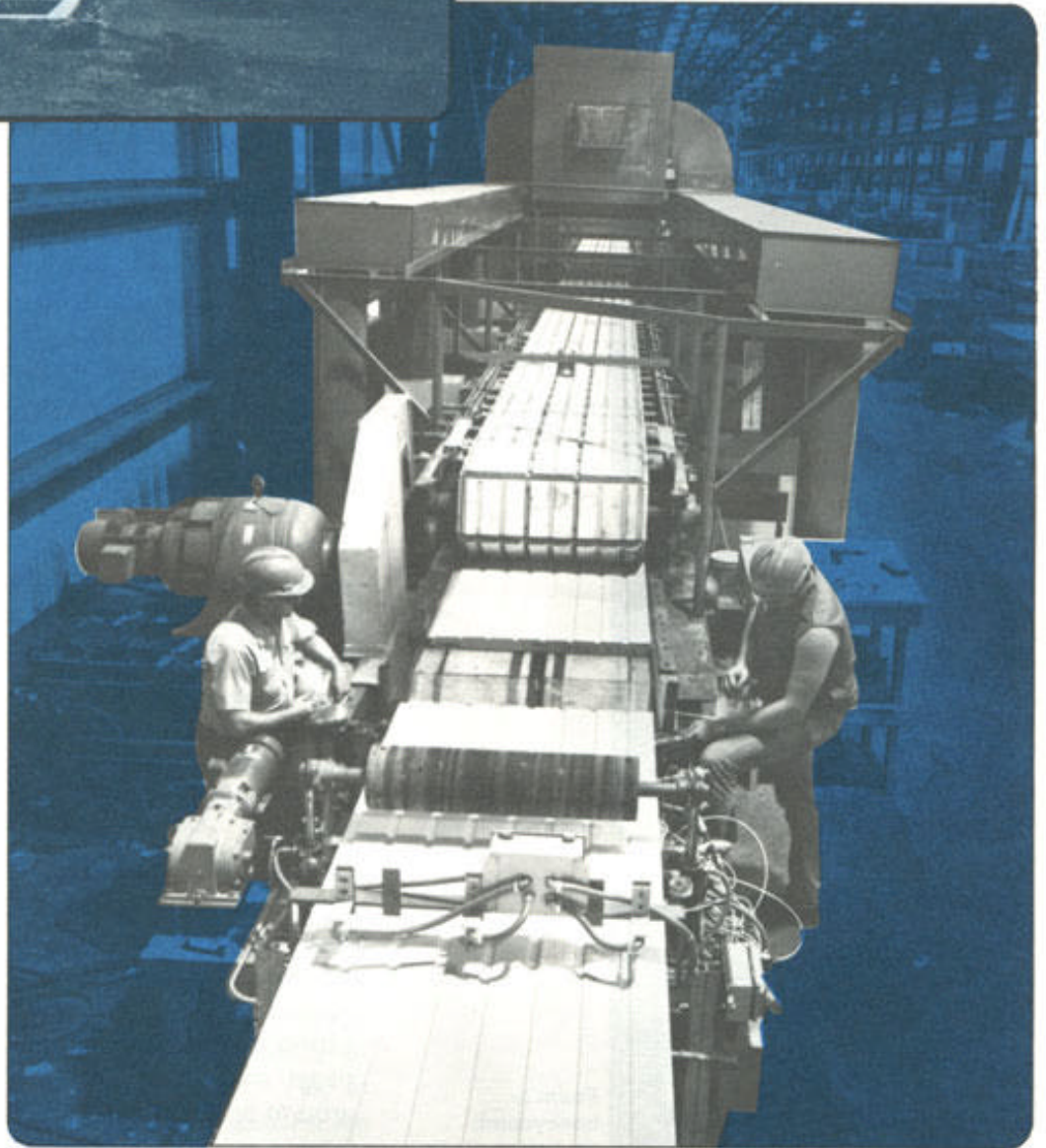


CONSTRUCTION MATERIALS

for an energy and cost conscious era.



A modern insulated home assembled from 9' wide panels on edge, (Kaiser), illustrating the 1-Side-Of-A-House-In-3-Minutes* Technique.



Finished building panels emerge in a continuous stream on Stran Steel Foamboarder Line.

NEW INSULATED BUILDING MATERIAL PRODUCED CONTINUOUSLY

Today's modern machinery can produce a finished building panel—ready to install. Both interior and exterior walls are attractively finished with an appearance appropriate to the use, whether industrial, commercial, residential or mobile.

EASY TO INSTALL

On-site labor time is reduced since the



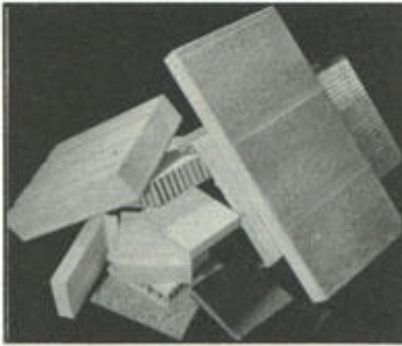
Formed edge panels join easily to form a hidden, weather tight joint.

panel is unitized, with both surfaces and insulation combined into one piece. Panel units interlock for a sealed continuous appearance.

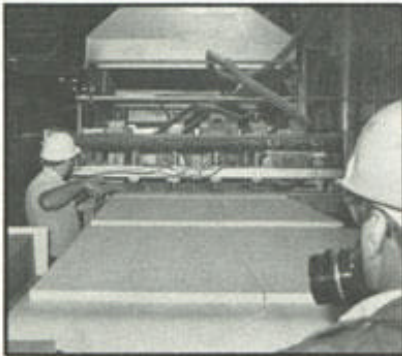
ATTRACTIVE FINISHES

Since surfaces can be of steel, aluminum, plastic, wood, hardboard, gypsum, perlite, fiber, concrete, aggregate, paper or any material available in sheet form, finishes are unlimited. No additional finishing is necessary after the panel emerges from the machine.

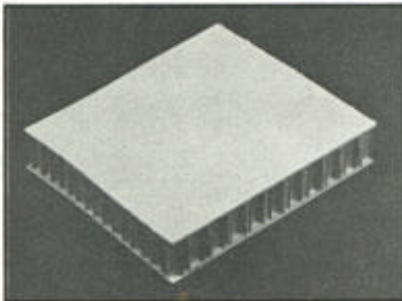
Additional exciting new technology for insulated roofing, sheathing and specialized building components is also illustrated in the following pages.



Broad selection of materials and finishes



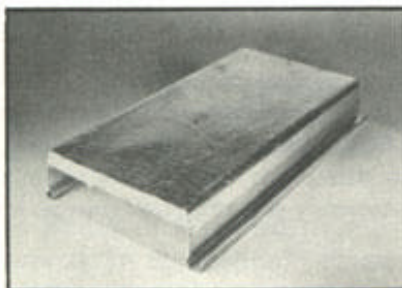
Paper-Phenolic foam roofing panel production



Paper-urethane and honeycomb



Foam or honeycomb on one machine



Rolled aluminum shape with scrim reinforced foil

LOW COST

Cost is minimized because most of the material waste common to other methods is eliminated. Manual operations such as fitting, adhesive application, fastening, laminating, pressing, handling and finishing are unnecessary.

INSULATION

Savings to the owner come from the integral cellular urethane core, which significantly reduces the cost of heating and air conditioning. 1" (25 mm) of urethane is equivalent in energy and fuel conservation to 2" to 3" (51 mm to 76 mm) of fiber glass, 6" (152 mm) of hardwood or 30" (762 mm) of brick.

MATERIALS

Almost any material which is suitable as a panel surface can be combined with a foam core. The core is typically a cellular urethane, cyanurate or phenolic. Alternatively, a variety of paper, metal or plastic honeycomb or other space materials can serve as the core. These can be bonded to the skins by cements or by a layer of urethane foam. This urethane layer can be varied to achieve the desired insulating value. A variety of fillers and reinforcing fibers are available to modify the cellular core properties.

PROCESS

The basic process consists of applying liquid urethane, cyanurate or phenolic chemicals between the two skins and controlling the skin spacing until the process of foaming and curing is complete. The technique for accomplishing this is different for each combination of skin materials. Only a few of the more popular examples follow:

(A) Both Skins Flexible

The chemical is spread uniformly on one of the skins (such as paper, thin plastic, metal foil, fabric) and the second skin is laid on top. The distribution can be accomplished by pouring from a stationary or reciprocating mixing head followed by laying down the second paper and running the combination between accurately ground and spaced rolls (called nip rolls, metering rolls, doctor rolls, or spreading rolls) which cause the liquid to flow to a uniform thickness.

A better method of uniform distribution is a curtain laydown* of liquid which requires no metering rolls. The more accurate placement of chemicals with a minimum of displacement after creaming has started results in more uniform cell orientation and greater dimensioned stability.

Immediately after either of the above laydown methods, the combination passes into the gap between two restraining surfaces. The gap is accurately set to the

thickness of the panel desired. The liquid foams to fill the space between the two skins. Additional foaming action creates a pressure (within a range from .5 to 5 lb/sq in (.03 to .35 kgms/sq cm) depending on formulation and other factors) between both conveyors. The conveyor length and speed are such that when the panel emerges, it is fully cured and will not continue to grow in thickness.

(B) One Skin Flexible, One Rigid

A metering roll is usually not recommended, because warpage or variation in rigid skin thickness prevents accurate roll metering. In addition, since the skin combination does not have balanced flexural and expansion properties, the stresses built into the foam by the metering roll may cause excessive distortion and delamination. Curtain laydown* is preferred. Preheating of all skins is recommended, but is definitely needed for rigid skins because of its greater heat-sink property. Provision is also needed to prevent leakage between butted ends and at the sides of the rigid skin sections which form the bottom of the skin-liquid-skin combination. This can be accomplished in the Edgemold process*. Otherwise the process is similar to (A).

(C) One Skin Flexible, One Rigid But Porous

Metering roll distribution causes excessive loss of chemical into the porous substrate and is therefore not recommended. Curtain laydown* is successful. Otherwise the process is similar to (B).

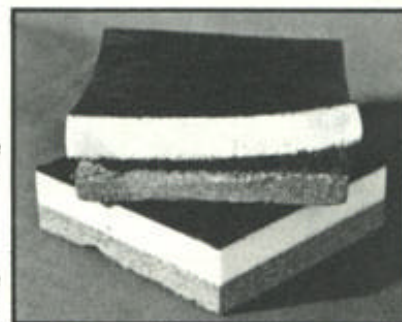
(D) Both Skins Rigid

With both skins spaced to the final panel dimension, urethane chemicals are distributed between them by means of a reciprocating Slim-Mix system*. Otherwise the process is similar to (B).

CHEMICALS

Urethane, cyanurate and phenolic foams are plural liquid component systems. The components are metered, mixed and dispensed continuously by equipment which is extremely precise. A wide variety of machines are manufactured for this purpose. Yet, in spite of such a broad selection, special modifications are often required to suit the process requirements. By proper formulation of selected chemicals, foam properties such as strength, density, cell structure, dimensional stability, insulating properties, fire retardance, and others can be attained. As dispensed, the liquids are usually of a thick syrupy consistency. Two processes occur simultaneously in the mixture. Freon or other gases are released within the liquid to form the minute bubbles which create the foam. The chemicals also polymerize to form the huge cross-linked chain molecule which characterizes the final urethane or other com-

Unstable Panel

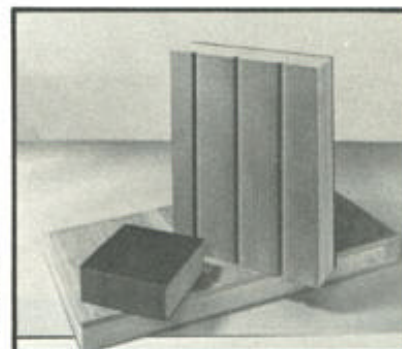


Stable Panel

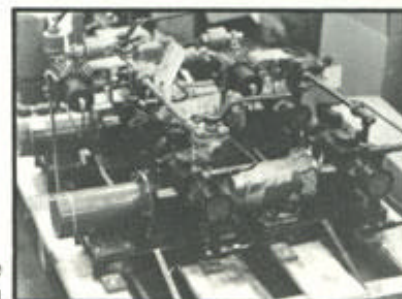
Uniform distribution by curtain laydown*



Foam Core Panels with metal & wood skins

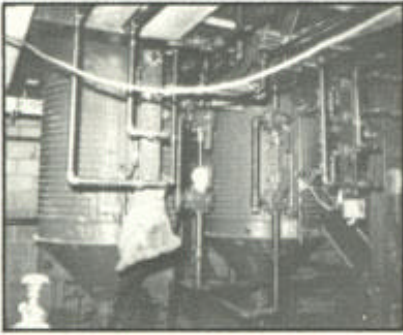


Urethane metering system

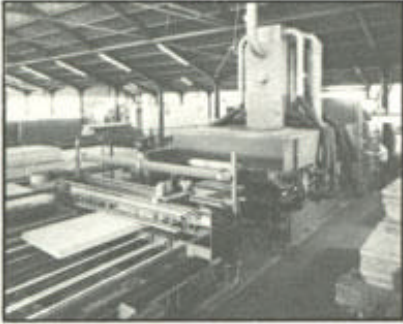


Urethane dispense station

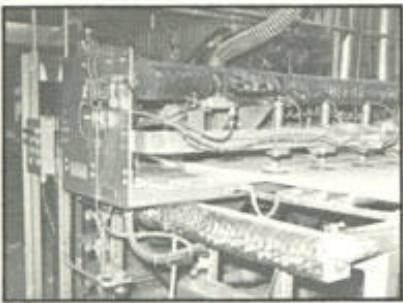




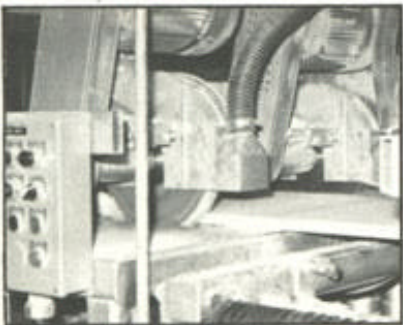
Tanks
for roofing
panel plant



4' wide panel
emerging from a
9' Foamborder



Length cut



Width trimming
and slitting

pound. This compound being a thermoset material will not melt when heated.

This simplified description omits the functions of various additives which control the size and distribution of the cells, the relative rates at which the foaming and polymerization occur, its fire retardance, etc.

FORMING MACHINERY

Prior to 1979 the accepted process for continuous panel forming utilized the "double-belt". The leader in this field was the Armorbelt Pressure Tunnel* which, in various forms, consisted of two, three or four synchronized Armorbelts capable of heating and shaping the expanding foam to produce panels and slabs to an accuracy of $+0.030''$ (0.762 mm).

In 1979 Kornylak made a significant breakthrough with the development of the Process Tunnel, able to produce panels at speeds in excess of 200 ft/min. (60.96 m/min.) with a thickness accuracy of $+0.010''$ (0.254 mm). The double belt was replaced by accurately ground die plates thus eliminating all belt marks resulting in a smooth "optically flat" surface. Higher pressures, temperatures and heat transfer rates permit faster line speed and greater flexibility in formulation choice.

The preferred selection today is a Process Tunnel Foamboarder for panels with flexible skins and the "double belt" Armorbelt Foamboarder for rigid skin panels.

CHEMICAL STORAGE

The various chemicals, when purchased in large quantities, are usually stored outdoors in tanks equipped with features such as agitation, inert gas blanketing, pressurization, heating, cooling, insulation, and special metals or linings to preserve the peak performance properties of these chemicals. Tanks are fitted with piping, valves, strainers, etc. for quick, safe loading and unloading.

CHEMICAL CONDITIONING

Prior to dispensing, a supply of each of the chemicals is transferred from the bulk storage facility to smaller "day tanks" or "use tanks." These tanks are usually indoors, adjacent to the dispensing area and are equipped to accurately hold their contents at desired temperatures.

CONTINUOUS PRODUCTION OF PANELS

The two basic materials are panel skins and chemicals for the core. The production system begins with provisions for receiving and storing skins and chemicals. Skin materials, if flexible, are fed into the line from rolls. Rigid skins are either hand-fed or automatically dispensed. The chemicals after preconditioning are accu-

rately metered, mixed and dispensed. The dispensing system is usually by stationary pour, reciprocating pour, or by Curtain Laydown*. Skins are positioned by the Armorbelt or Process Tunnel press section. They are automatically cut to width and length and then either fed directly into a waiting truck or stacked on pallets. Pallets travel through plastic film wrap into the warehouse. One operator backed by material handling services to deliver material and remove finished product is normally capable to run such a line.

PANEL MACHINERY OFFERED BY KORNYLAK CORPORATION

Kornylak has been the U. S. pioneer in continuous foam core panel production and its slab and panel lines have been furnished to Eight countries. The revolutionary Process Tunnel Foamboarder sets a new high standard in panel production and additional development projects underway promise additional breakthroughs in the years ahead.

CEILING PANELS

Large, lightweight panels with flexible skins have been produced with either foam or honeycomb cores on the same line.

WALL PANELS

Panels with rigid skins, both sides with cores of urethane or cyanurate, have been produced with core thicknesses from 1" to 5 1/2" (25 mm to 140 mm). A variety of edge designs permit joining methods such as interlocking, lapping, and butting.

Several machines have a press width of 9 ft (2.74 meters) so that finished panels can be installed on edge to produce the entire side of a house in one piece. Cutouts for doors and windows can be made after panel production or can be programmed into the panel during its production.

EXPERIMENTAL BUILDING MEMBERS

Lab tests with combinations of many commonly available building materials and chemicals have resulted in promising new construction possibilities. Additional development in new building components and processes will continue. Request for experimental projects are welcome.

FEATURES OF KORNYLAK MACHINERY

The Kornylak Corporation has been a leader in innovation related to productivity improvement. Its success is illustrated by its 50 U.S. patents issued and another 50 applied for. A few of the features covered are shown. The Armorbelt* on which Kornylak moving presses are based are chainless metal belts with tight, smooth joints. They are guided for accurate tracking. The



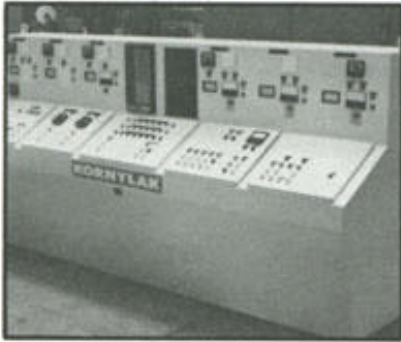
Film wrapped
pallet of
roofing panels



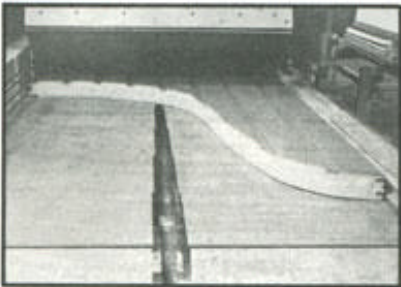
Process Tunnel*
produces
accurate panels
at 200 ft/min.



Leadership
through
patented
innovation



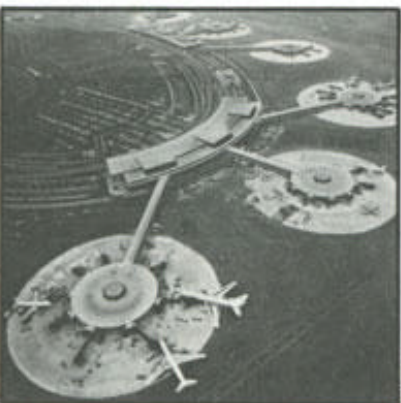
Controls



Side shift*
releases edges



House built of 9'
wide panels with
pre-finished
interior and
exterior



Air terminal
insulated roofing
installation

panel molding pressure is easily supported on the belt's ball bearing rollers for smooth movement and minimum horsepower. The tight belt combines with a smooth side enclosure, allowing introduction of hot air to control belt temperature at optimum processing temperature. Accurate belt spacing is assured by gage blocks and calibrated hydraulic pressure devices along the entire press length. Overpressure caused by overfeed or changes in chemical reaction are quickly detected to actuate either an alarm or an automatic correction. Should the correction not be made, a fail-safe system allows the upper press conveyor to rise, preventing severe equipment damage.

Where the panel edge design calls for grooves or projections, these are accommodated by side dies on the bottom belt. These dies are moved inward at the feed-in end of the press to engage the skins and to act as Edgemolds*. At the discharge end the dies separate to release the configured panel edge. This is possible because of the split Armorbelt* design and a unique side-shifting belt design.

Aarmorbelt's* heavy-duty bearing rollers are automatically lubricated for long life and low horsepower. The rolls run on accurately machined, hard-alloy tracks.

The Slim-Mix* dispenser has a thickness of only 1" (25 mm), allowing it to distribute chemicals between two closely spaced rigid panels. Coupled with its carriage-mounted reciprocator, it is capable of sophisticated laydown patterns to match any predetermined design.

By using two Slim-Mix* units to dispense from both sides of a wide panel (9 - 12 ft) (2.74 - 3.66 meters) with pre-cut and framed door and window openings, the entire side of a house can be produced in one piece every 3 to 5 minutes.

In another variation, 3 or 4 panels per house side can be combined with a properly designed metal building frame to produce a house which would survive an earthquake with minimum damage.

The Process Tunnel, ideal for production of roofing and sheathing features extremely high speeds, smooth surface, accurate thickness, quiet operation, safety, high thermal efficiency, accurate and selective temperature control, and lower initial and operating costs.

Fire safety, a current concern in home building is met by proper foam selection, the use of fire-resistant skins or the addition of fire-resistant coatings. These developments result in foam core construction superior in fire safety to a major number of conventionally constructed homes.

THE FUTURE

The economy, convenience, performance and capabilities not otherwise available offer architects, builders and owners an important new approach to home building. Attractive, unusual design effects, greater space, efficiency and comfort will spur the general acceptance of the foam core panel home and will permit developing nations to leapfrog many of the soon-to-be-outdated building systems we now use.

KORNYLAK

The Kornylak Corporation is a company engaged in a number of frontier technologies. It is managed by four members of the Kornylak family with degrees in engineering and physics. In addition, a staff of other engineering and technical employees fill out the management team and supporting staff. The company enjoys a world leadership position in a number of these fields, foam core panel machinery being one of them. The plant facility in Hamilton is large enough to set up and test a number of panel lines simultaneously, producing product for customer approval before shipment of the machinery.

*These processes and equipment are among the many proprietary items developed by Kornylak Corporation and offered in Kornylak systems.



Roofing installation air cargo hangars



Kornylak's computer room



Flexible foam scrap rebonder being loaded on rail car



A portion of the Kornylak plant



Continuous rebound line being assembled in the Kornylak plant



Flexible foam slab machinery



Production of the air cargo roofing



Rebonded carpet underlay storage system

Several of Kornylak's other products are illustrated. All are directed toward the improvement of productivity and the betterment of our standard of living. The broad coverage of technology covered by these products is an indication of the versatility of the Kornylak Corporation in coping with new technical challenges.



Monoflo production line conveyor in TV plant.



Wide Armorbelt conveys mattresses and large cushions.



Vertical conveyor for shipboard use.



Rapid pick up and discharge of lumber.



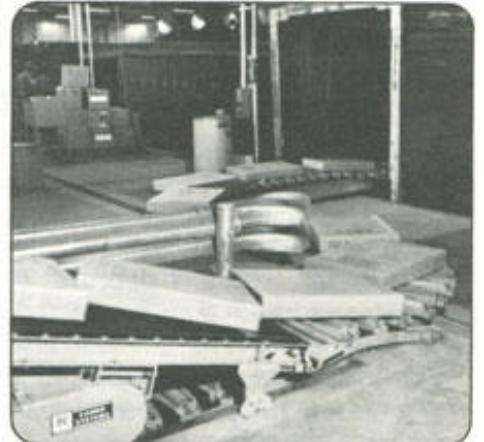
Karry-All swing cab and height adjustable conveyorized deck.



High Lift loads air cargo.



Palletflo order picking system.



Snake conveyor loads truck



Live storage system for cartons and pallets.

We hope this brochure has helped you to know us better and that it encourages you to discuss your equipment or process needs with us. Our technical people will respond to your inquiry by personal visit, combined with written communication.

An advisable first step in any large project is to commit it to writing. Please submit as much detail as possible so that we can respond with a helpful proposal.

Kornylak is midway between Cincinnati and Dayton, Ohio airports.

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