



# Products and Services



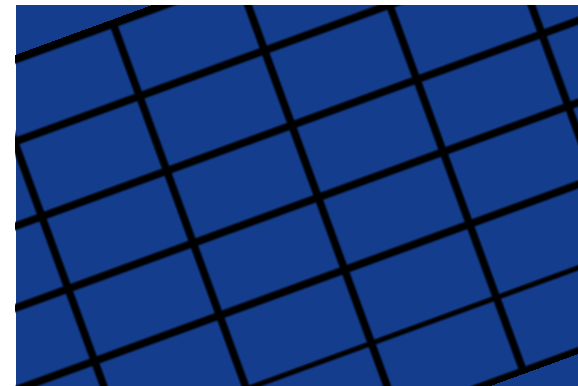
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# About Us

We are experts for hire who specialize in meeting all the challenges faced in the Composites, Fiberglass Reinforced Plastics (FRP/GRP), and Thermoforming industries. We offer a wide range of consulting services, research, product design, prototyping, and a full line of advanced production equipment. Our growth may be attributed to our strong commitment to quality, innovation and services. All of our products and services are backed by decades of experience and engineering excellence.

Seawolf Design, Inc. is recognized as a industry leader in automation engineering for large part vacuum forming and finishing. We offer unlimited support to bath and spa fabricators, boat builders, architectural products, and other varied projects. Our main passion is bringing manufacturers to a new level of efficiency and product quality by being able to think outside ordinary terms of thought. Seawolf has built complete “turn-key” production facilities for companies in the United States, Europe and the Middle East. Our company has won numerous international awards for its inventions and cost-saving innovations.



# Recycling Systems

## Introduction

Unfilled resin systems are not neat! It continues to amaze us that so many manufacturers persist in using neat or obsolete filled resin systems, lacking optimal performance and cost effectiveness. Over and over again, we have proven to manufacturers that using today's technology can notably increase their performance and provide them with significantly higher profits.



Our filled resin systems are not just resin and filler.. They are a highly developed combination of components - taking into account chemical and physical interaction. Not only do we offer the ability to lower material costs, but you will also be able to:

- lower or eliminate roll-out
- eliminate air entrapment
- significantly decrease V.O.C.'s
- decrease shrinkages
- lower labor costs
- increase product quality.

All of these benefits are yours, in addition to improving strength and adhesion to acrylic!

Currently, this process is used by OMC Rydsfabriken, in Sweden, to produce "ecoboats".

The process this company uses involves recycled FRP/GRP, sprayed together with virgin material between conventional layers. The recyclate saves material and labor while improving performance, including fatigue resistance; in comparison to traditional materials such as plywood and Coremat™.

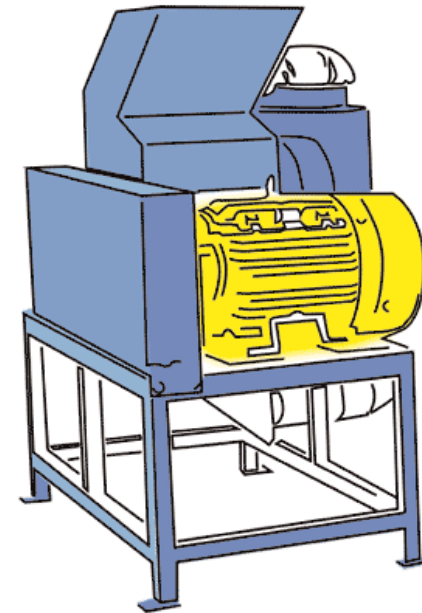


## Recycling and Dry Additive System

Recycling & Dry Additive is a two-part system designed to complement each other together or separately.

Part of the system is a machine called a Grinder/Muncher. This machine is not a mulcher, but similar to a hammer-mill. Built to withstand fiberglass abrasion while maintaining a low temperature, the machine sustains the fibers' integrity for viable, effective reuse while virtually eliminating the risk of spontaneous combustion.

The other part of the system is a metering and transportation attachment to a fiberglass spray gun; which is air powered. This process enables one to use the recycled FRP with pre-existing spray-up machinery. It includes a hopper and a metering device which attaches to an existing chopper/spray-gun and allows one to spray a stream.



### Recycle Spray-Up Uses:

#### A. Types of applications for recycled FRP:

|                        |                     |
|------------------------|---------------------|
| spray up               | RTM                 |
| putties                | pre-forms           |
| casting                | compression molding |
| concrete reinforcement | pultrusion          |

#### B. Types of products that can be made from recycled FRP:

|           |                   |
|-----------|-------------------|
| bath tubs | boats             |
| spas      | modular buildings |
| sinks     | moldings          |

#### C. Other alternative scrap:

|               |                   |
|---------------|-------------------|
| acrylic       | glass bottles     |
| laminates     | PET (coke bottle) |
| polyester     |                   |
| epoxy         |                   |
| aluminum cans |                   |

*Note: Soft plastics should not be used*

## Common Questions about the Grinder

### 1. Is there any special machine care requirements?

No, but we suggest that you clean the dust bag once a week, on average, and check the hammer-knives periodically.

### 2. How do you use the grinder?

Using the machine is simple: turn it on and start inserting the material to be ground in the hopper.

### 3. How long can the machine be run productively?

Our machine can be run for exceedingly long times. The longest period of time we ran the machine was for 8 hours straight every day for a week. We have had our machine for 12 years now and it is actively used.

### 4. Is the machine very noisy?

Yes, that is why we suggest building a sound deadening compartment with only the throat of the hopper protruding. We do not have a special booth for our machine, but we use ear plugs.

### 5. Does the machine have gauges?

No, the machines does not have nor needs gauges.

### 6. How many pounds can be processed per hour?

- Model 128-SW 20 HP  
Throat: 9"x12"  
Processes: 900 - 1,000 lb. per hour
- Model 169-SW 30 HP  
Throat: 9"x16"  
Processes: 1,500 lb. per hour
- Model 249-SW 40 HP  
Throat: 9"x24"  
Processes: 1,700 - 1,800 lb. per hour



### 7. What are the consumable parts and life span?

The hammer-knives for the machine have four cutting sides. These sides can easily be rotated for reuse and sharpening; eventually they will wear out.

### 8. What are the available screen sizes?

Screen size (1/8", 3/16", 1/4", 3/8", 1/2", 5/8", and 3/4") determines the length and strength of the fibers. The screens are subject to replacement, depending on usage, after several years.

### 9. What are the available voltages?

The machine can be supplied for 3 Phase 240V, 380V, or 460V.

### 10. Do you make customized machines?

Yes, we will design, fabricate and prototype for our customer needs. We also offer different throat and screen configurations.

## No Roll™ Spray-Up System

After seven years of development, Seawolf announced a new No Roll Spray-Up System, on January 5, 2005. No Roll™ eliminates almost all rework and cuts material cost by 10% or more. The No Roll™ spray-up system can eliminate all of the rollout labor, using 1" long chop. Boat builders, bath tub and other manufactures who utilize open mold FRP fabrication can benefit greatly by reducing unnecessary production costs.

The No Roll™ Spray-Up System uses an internal, high-solid spray laminate mix of up to 25% glass fiber that requires no rollout. The benefits are:

- V.O.C. levels as low as 10 ppm
- Fast mold turnover: 3 to 6 minute gel times
- Greater physical strength and reduced water absorption
- Application at a thickness between 0.040 to 0.500 of an inch

The new spray-up system has already been used by Porta Products in Florida to produce kiosks at the Miami International Airport. Out of 360 panels produced for the project, only one bubble needed to be repaired. In addition, the new method was used to produce an 18-foot boat, manufactured by Boston Whaler in 1998. The boat has been fully tested and is Coast Guard certified.



## Count them... 7 workers using traditional hand lay-up method!



Old Traditional Hand Lay-up



With Seawolf's No-Roll Spray-up system there's virtually no air entrapment... lowering labor costs radically.

# THE FUTURE OF SPRAY-UP

BY WOLFGANG UNGER

Innovation comes slow in the composite fabrication industry. Suffice to say, it is a "me too" industry in which few wish to take the lead. As much as I personally dislike government intervention, the truth is that the only real changes have been triggered by official mandate.

Spray-up is still the best and the worst way to make fiberglass parts. In many cases it is the only feasible way, especially when there are a limited number of parts, or they are very large and complex.

**Since the process has been around a very long time unfortunately very few people give any thought to improving it.**

In the end, many would much rather complain about OSHA or labor and material costs than concentrate on emission and cost reduction. Human nature resents

change: one manager told me bluntly, he was not interested in any new system, since his boss would take credit if it worked, or he would be fired if it did not.

### **The use of re-enforcing fillers and recycled fibers**

When using fillers many mistakes are made because cost per pound is the predominant issue in most people's mind. The real cost in fabrication should be evaluated in terms of cost per cubic inch. The most common fillers calcium carbonate and calcium sulfate do not contribute much to cost reduction; but at least the latter provides fire retardant qualities. On the other hand there are many materials that improve quality and reduce costs; but these are seldom considered because of that per-pound-cost mentality. When OEMs see a per pound cost of \$12 for plastic micro spheres they think it is horrendous. But if they took the time to figure it out, it is

actually very reasonable. One percent of plastic micro spheres can give as much as thirty percent increase in volume. Additionally, it will reduce component weight, reduce labor and improve impact strength. Perhaps most importantly, in these environmentally vigilant times, it will also reduce V.O.C. emissions. There are also natural fibers which can be substituted for a portion of the expensive glass at one third the cost. An added benefit to using natural fiber is absorption of the styrene, keeping it in the product and out of the environment.

Another way to reduce costs and emissions is to reuse the fiberglass trimmings from parts, which mostly end up overwhelming land fills and generating ever increasing disposal costs. There are two ways to recycle fiberglass both of which require it to be ground.

We offer a system which uses recycled materials. This system will take as much as 60 percent recycled fiberglass. A simpler method is using it as a dry material added to the stream of resin. Here, the maximum amount you can put in is about twenty-five to thirty percent. Fatigue

**The benefits of recycling include cost reductions and considerable laminate property improvements, especially in impact and fatigue.**

improvements are phenomenal, which should be very interesting to most boat manufacturers.

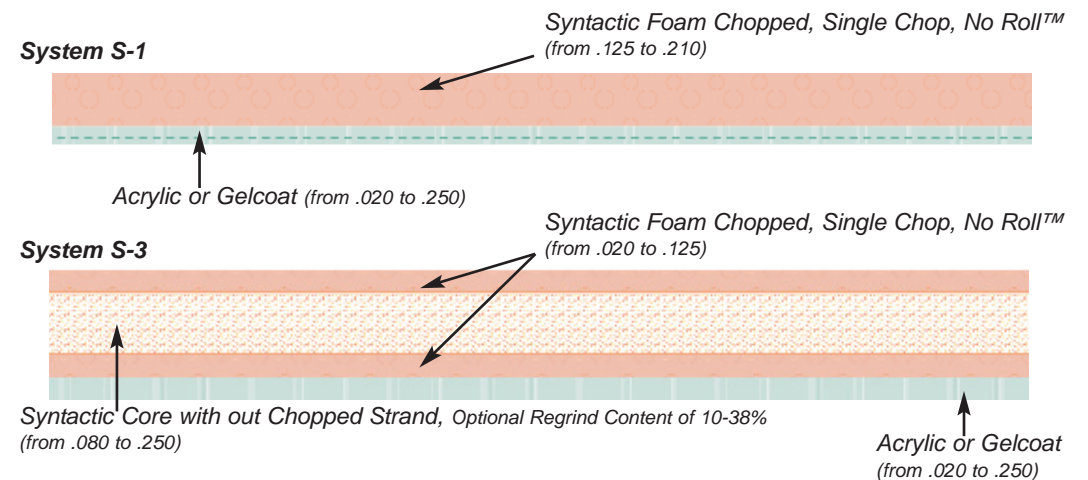
We are presently consulting with businesses all over the world and we have found that many times we are able to use local material at a lower cost. There are native organic materials available in many places that can be incorporated with fiberglass, having no adverse effect to performance or ecology, while reducing cost and weight. For instance, we have been successful in both Egypt and Yugoslavia

with using sand.

**Sandwich Construction**  
Something else which is not fully or sufficiently utilized is sandwich construction. There is very seldom any need to have a half inch laminate. Using two 1/8 inch laminates with a low weight, low cost core would easily perform the same or better.

**Gelcoat Alternatives**  
While I personally believe the health risks of styrene have been highly exaggerated, I think that the threat to our atmosphere has received inadequate attention. One of the

## Sandwich Construction



solutions to the styrene problem would be to eliminate gel-coat (which accounts for roughly half of the VOC emissions and is the biggest contributor to the slow production process) by replacing it with thermo-plastic skin.

Eliminating gelcoat would increase production speed and reduce laminate roll-out (which in itself releases many VOC into the air). An acrylic skin can actually improve the end product as well when one considers its UV resistant characteristics, its gloss retention properties and its easier, quicker repair techniques. For example, mold turnaround for an 18-foot boat (now at about 8 hours in the mold) would be reduced to about 2 hours. Ninety percent of the repair work and touch-up that has to be done on a gel-coat mold would be eliminated; this has been proven over and over in the bathtub and spa industry which is virtually all acrylic now, and has solved almost all its problems with blistering, osmosis and chalking.

Genmar's new VEC process is certainly ingenious; the concern is that in the long term it might result in an even more highly concentrated industry; which is not necessarily good. It might reduce innovation in design, and eliminate small production runs, unless spray-up manufacturers open their minds to innovation. Irvin Jacobs is one leader who has taken big risks in support of new technology.

#### **Innovations**

Forming sheet and then reinforcing it will work for boats under 40 feet. For really big yachts, gel coat or at least a base coat will be hard to replace. Then again it is possible to use a barrier coat containing glass fibers. This can be applied over the gel coat as soon as the gel-coat has started gelling. The skin coat can be cured in ten minutes, which allows the built coat to be finished rapidly. This will eliminate a lot of rework to repair surface defects as well.

I also see a need for more attention to training and modernizing machinery or equipment. There are two innovations I can envision:

The first is a combination of the VEC process with a thermo plastic skin.

Second, a combination of spray-up and vacuum infusion can be used. By using micro spheres the resin demand can be reduced by up to thirty percent, depending on the strength required. Generally half percent loading with micro spheres does not diminish affect the strength of the laminate since it eliminates resin rich areas and voids considerably.

**As regulations will get tougher, resin infusion and RTM will become more efficient..**

#### **Summary**

and unless these companies which practice spray-up improve their methods the process will be marginalized to prototyping and one up construction. On the bright side I know that the process can be modified to get under twenty PPM V.O.C. emissions without to much difficulty, it already has been shown that roll-out can be reduced which allows faster gel times. The new generation of spray guns with low pressure and very little atomization, and using the

**In other words the solution is in using American ingenuity, not in moving the production off shore.**

right fillers and reinforcements. V.O.C.s can be captured at the source rather than exhausted to the atmosphere. This, by the way, is becoming more difficult because these countries are catching on, they don't want their environment ruined either; at this time we are doing more

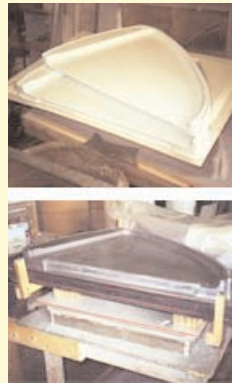
ecological work in South America and Asia than in the United States. Eliminating roll-out helps with the labor problem. In some cases we have reduced labor by sixty percent and reduced process time by up to eighty percent, thus also reducing mold investment.

The future of spray up is not as bleak as many believe; material and equipment manufacturers have made a lot of progress in the last few years. With cooperation between material suppliers, equipment manufacturers and builders, even more can be achieved. To paraphrase Winston Churchill: "It's amazing what can be accomplished if you don't care who gets the credit."

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# Mold Making Materials

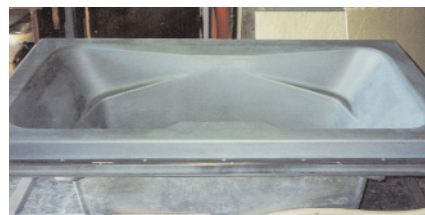
## The AL-Tool™ and the T-Lam™



These vacuum form molds exhibit extremely high temperature resistance with exceedingly long life. They resist temperatures up to 450°F, indefinitely. The oldest molds created with AL-Tool™ and T-Lam™ are still in continuous operation since 1973!

## AL-Tool™

- Thixotropic dry mixed compound
- Designed to be mixed with high quality ISO resin or Vinyl Ester tooling
- Optimum resistance to heat, fatigue and distortion of vacuum form tooling surfaces
- No print through



## T-Lam™

- Highly effective additive for high heat ISO tooling laminating resins
- Formulated for excellent air release, easy wet out, and greater structural strength
- Increases resin pliability
- Cost effective
- Long tool life
- Construction cost on large parts is reduced by less labor and construction time



Seawolf also provides Al-Release™ (mold release for aluminum molds) and Al-Cast™ (a castable formulation).



# Mold Making Classes

**Learn to make molds** with our accelerated classes and hands-on techniques. We will take you step by step on the how-to basics in one week. Realistically, one week is too short for a completion of a mold. If you just want to know the basics you can finish the mold at your leisure. If you want to know more about mold-making like a professional, it is imperative that you get trained properly. Please understand that equipment can be bought and experimented with, but mistakes can be costly.

• **Option 1** consists of three courses that span over three weeks. All material costs are included and Seawolf staff will take you step by step through the

processes of simple to complex mold making. It is strongly recommended that you take all of the courses.

• **Option 2** will allow you to jump right in to the process. This option does not include the cost of materials because you will be creating your first mold for your production uses. While you are making your mold Seawolf staff is present and will aid you during your first mold making experience.

• **Option 3** offers a three day course for experienced FRP mold makers. This course allows you to become familiar with high-temperature vacuum-forming molds.

## OPTION 1 INTRODUCTION TO MOLD MAKING USD 4000.00

Week 1 (40 hours)

This one-week course will teach you simple mold and plug techniques. It is designed to be followed up by Advanced Mold Making. Please realize that one week is not enough time to make a completed mold. (Tuition includes material cost.)

Schedule:

- Day 1 - Introduction to model (plug making)
- Day 2 - Hands-on plug making workshop
- Day 3 - Introduction to mold making
- Day 4 - Mold making workshop
- Day 5 - Recap and review

## ADVANCED MOLD MAKING USD 3000.00

Week 2 (40 hours)

Introduction to the chemistry for reinforced plastic mold making. Continues mold making training with complicated mold techniques,

including break-away molds and undercut mold techniques. (Tuition includes material cost.)



## OPTION 2 PRACTICAL MOLD MAKING USD 4000.00 plus cost of materials

This option allows you to make your own molds with our expertise at your disposal. Week 1 is USD 4000.00 plus cost of materials.

Additional weeks are USD 3000.00 plus cost of materials.

## OPTION 3 VACUUM FORMING MOLD COURSE USD 2000.00

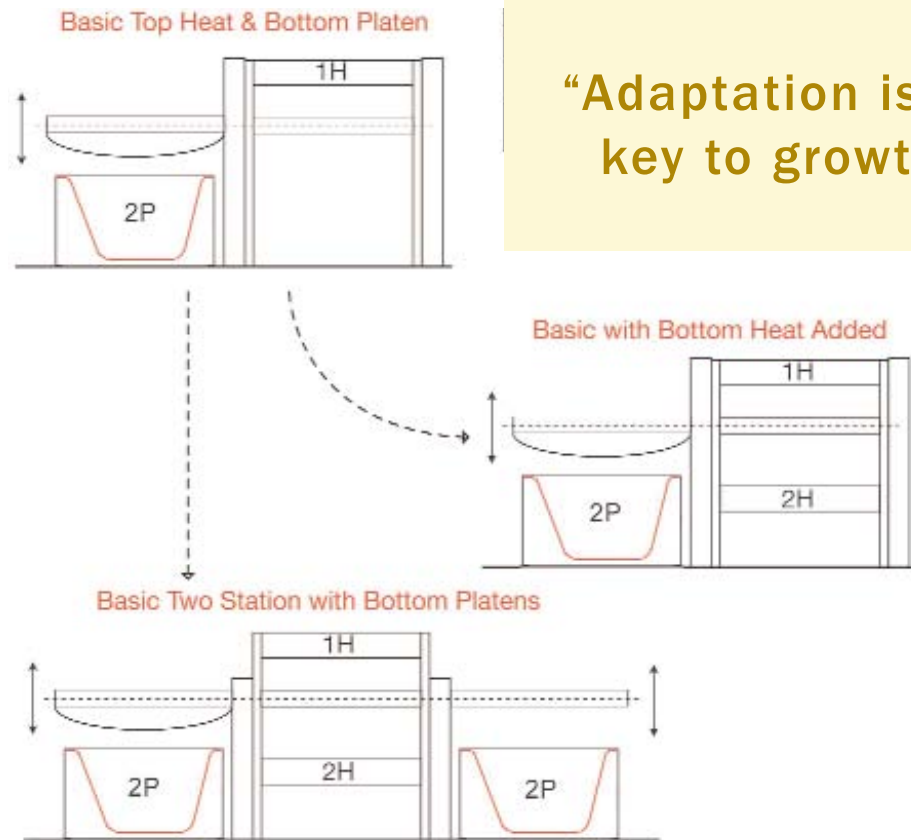
This is a 3-day course. Only for previously experienced FRP mold makers.

# Vacuum Formers

In today's tightly competitive industry, every opportunity to meet growing customer demands must be seized and capitalized upon.

Seawolf's Auxano Former™ provides superior system expandability and flexibility. No other thermoforming oven offers our cost effective method to resize and reshape your oven to your product.

The modular design allows easy additions to the system, including enlargement of the heating surface and an addition of a second form station. System installation and all air, vacuum, and electrical connections to be completed by customer. Equipment is delivered with all the necessary pressure regulators, lubricators, gauges, etc. to be connected to your electrical and air supply.



**“Adaptation is the key to growth.”**

## Available Machine Specifications

- Operation: Manual, Semi Automatic, Fully Automatic with Bradley PLC
- Station Types: Single, Double, Double Enders, Dedicated Mold Carts
- Sheet Size: Customer defined
- Heat Type: Ceramic Infrared, Top, Bottom
- Platen: Top, Bottom
- Clamping: Manual Quick Clamping, Pneumatic
- Offer Max Draw
- Rietschle Vacuum Pump: Horse Power variations
- Electrical Supply: 3 Phase 240V, 380V, or 460V
- Control Panel: Percentage Timer, Push Button

## We also offer

- Max Draw
- Training for Vacuum Forming and Mold Making Packages.
- Sheet Loading and Unloading Equipment



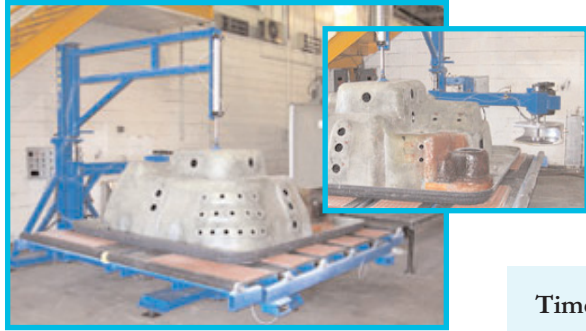
## Various Types of Radiant Heating Elements (Pros & Cons)

We use ceramic panels in our top heating due to their performance. They are very efficient without losing quality and are decently priced.

| Heating Type         | Efficiency new | Efficiency after 6 months | Average Life in Hours | Comment                                   |
|----------------------|----------------|---------------------------|-----------------------|---|
| Ceramic Panels       | 62%            | 55%                       | 12,000-25,000         | Best buy<br>Uniform heat<br>Efficient     |
| Quartz Panels        | 55%            | 48%                       | 8,000-10,000          | Uniform heat                              |
| Coiled Michrome Wire | 16-18%         | 8-10%                     | 1,500                 | Cheapest<br>Initially very inefficient    |
| Tubular Rods         | 42%            | 21%                       | 3,000                 | Inexpensive<br>Heat non-uniformity        |
| Gas Fired Infrared   | 40-45%         | 25%                       | 5,000-6,000           | Cheapest to operate<br>Many disadvantages |



# Trim Saws



Trim Saw with Hold Down



Trim Saw with Leg Trimmer



Shower Trimmer



Trim Saw without Hold Down

**Time is money!** In today's tightly competitive industry, every opportunity to trim waste and maximize profits must be seized. Automated Trimsaws save time, produce a superior product, and reduce employee dust exposure.

Our Automated Trimsaw is one such powerful tool to help you seize more profits out of your production line.

- Decrease costly labor
- Increase production speed
- Lower employee risks

**Time to cut out the waste!**

#### Available Machine Specifications

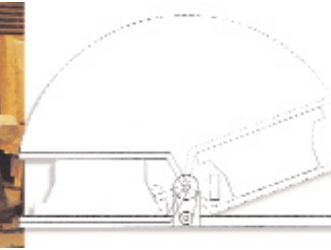
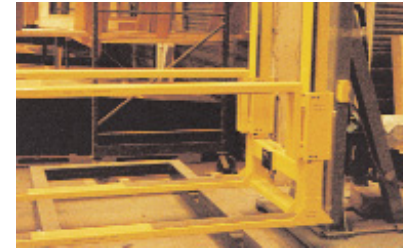
- Operation: Manual, Semi Automatic, Fully Automatic with Bradley PLC
- Table Size and Height Adjustment: Customer defined
- Blades: Diamond or Carbide
- Electrical Supply: 3 Phase 240V, 380V, or 460V
- Control Panel: Percentage Timer, Push Button

We also offer

- Water Mist Dust Suppressant
- Hold Down
- Leg Trimmer
- Modifications for apron/skirted tubs or showers

# Spa Flippers

## A. Stationary



## B. Articulating (Pac Man)



# Supporting Services

## Turn-Key Factory Set Up

Whether you need a single piece of equipment or an entire plant, what you really need is a team that will help you get the best results from your investment and WE KNOW HOW. We don't just fabricate, we build solutions. Our designs are simple, efficient, and provide short learning curves so production can start quickly. Our plant designs provide seamless product flow with modular features that allow easy expansion and upgrades to prevent early obsolescence.

## Training and Supervision

We are well versed and experienced in all aspects of techniques and procedures regarding vacuum forming, FRP/GRP manufacturing, and mold making. We offer our expertise and training sessions in support of any of our products and services.

