

Yamaha Pianos



INTRODUCTION

The construction of pianos is a highly technical process involving hundreds of distinctly different operations. Here we have tried to :

*Outline the plants in which these operations take place
Detail a few of the processes in which Yamaha are far superior*

It should be remembered that Yamaha, unlike most other makers, is a Manufacturer – meaning that Yamaha make nearly all of their own parts. Because of small production numbers, most piano makers are only assemblers – buying cases, backs, keyboards, actions, pedal systems and other parts from parts manufacturers. Although assembled by different companies, many of these pianos are much the same because they are made from the same parts. Assemblers have little or no control over the quality of their finished product.

Yamaha's greatest advantage lies in their ability to produce hundreds of upright and grand pianos each day. Such production numbers require the purchase of enormous amounts of raw materials – the most important of these being spruce timber. Because Yamaha is the largest producer of this expensive material, they have first choice – others choose from what remains.

Seasoning of timber is one of the most important aspects of piano production, and takes up to seven years. Since this material is virtually tied up capital, many small manufacturers tend to skimp on this vital process. Yamaha being the biggest manufacturer is able to stockpile the timber.



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YAMAHA'S MAJOR PIANO PRODUCTION PLANTS

Iwata Factory

This foundry was established in 1966. It covers a total area of 123,428 square metres, and can produce in excess of 1000 piano frames each day, and is by far, the largest piano frame manufacturing plants in the world.

Hamamatsu Factory

Covering 346,000 square metres and employing 500 people, this plant is responsible for piano action construction, also hammer and bass string making. Piano actions consist of around 5500 parts, many of which are machined to a tolerance of 5/100th of a millimeter – the highest possible precision in woodworking. Produces models - GC1, C1, C2, C3, C5, C6, C7 and CFIIS.

Kakegawa Plant

This plant is responsible for the assembly of upright pianos. Being the world's largest piano assembly plant, it covers 228,000 square metres and produces only upright pianos. It is highly mechanized, computer controlled and blends technology with the skilled hands of our highly motivated craftsmen. Produces models – T121, U1, U3, U5.

Jakarta Plant

This plant offers the same cutting-edge machine and hand-crafting technology, together with start of the art facilities. Produces models – C109, C113 and GB1.

YMM Georgia

Our US piano manufacturing facility in Thomastown, began manufacturing pianos in 1983, and currently employs 350 people. Produces model T116PM.



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PRODUCTION PROCESSES

Iron Frames and the Vacuum Process

The first consideration in piano design is the frame. Because piano frames have a large surface area and at the same time a thin cross section, many problems can arise, which require specialized skills and expensive equipment to overcome. For this reason, piano manufacturers producing their own frames are almost non-existent. Unless huge numbers of frames are to be made, the setting up of a sophisticated frame plant is not economical. Most piano manufacturers are therefore in the hands of their suppliers, and have little or no say in the way their frames are produced.

With the construction of the Iwata factory, Yamaha developed the world's first fully automatic vacuum process plant. Traditional iron frame making is by 'green sand mould' process which employs a mixture of sand, clay and water. The Vacuum Process uses only dry powdered sand, which is held in a vacuum. Because no water is present in the mould, the frame cools far more evenly, minimizing warping and maximizing accuracy and acoustic properties.

Acrylonitrile Styrene

Piano actions have been traditionally made from maple timber. In three specific areas of the action, more wear occurs than anywhere else, as the parts actually rub together. These friction areas are coated with a graphite substance to reduce wear and give the action a smooth touch. As the lubricant wears off, the piano's touch deteriorates and finally with bare wood rubbing against doe skin or felt, damage starts to occur. Because timber is harder in some places than others, it wears unevenly leaving sharp edges which in turn accelerate the wear. The only remedy for this is to dismantle the action, sand all the timber edges and apply more lubricant – an expensive procedure.

In these problem areas, Yamaha has used 'acrylonitrile styrene' for the past 30 years. This material is of one consistency and is self lubricating. Styrene also has the advantages of being lighter, stronger, more durable and more flexible than timber. Most manufacturers recognize the benefits of this product, but as the break-even point in production is 100,000 units it falls way beyond their means.



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Felt

Yamaha buys felt from three different manufacturers – Nippon Felt, Nippon Keori and Royal George. All three companies manufacture felt according to Yamaha's instructions and no quality difference exists. Yamaha does not differentiate by brand name – only by the hardness and resilience of each felt sheet. This test determines which particular model each sheet will be used for. Never be guided by a particular brand of felt, for example, Royal George is the name of a mill which produces felt, this felt comes in many different grades of quality – the best being very good, but expensive, some not so good, and of course much cheaper.

Soundboards

Since the making of the first piano, manufacturers have experimented with different types of soundboard materials. Despite exhaustive experiments, no material has been found to rival spruce timber, which is used by all of the world's major manufacturers.

Spruce boards are selected for their straightness and tightness of grain and planked together (the more grains per centimeter – the more sound can be transmitted). The direction, straightness, and tightness of grain in the soundboard are major contributing factors to the tone of the finished instrument. Because only small amounts of timber have grain suitable for use in soundboards, their construction tends to be expensive. Some manufacturers bypass this important step by laminating spruce timber. The result is a much cheaper soundboard, but because the grain runs in three different directions, the tonal quality of these boards is not as good. Also, soundboards must be thicker in some places than others – an impossible task with plywood.

When finished, the soundboard is crowned and attached to the liner – a stable frame which holds the edges. Yamaha's advanced methods require the board to be artificially dried more than will finally be required. When the board is dried, it shrinks and is then attached to the liner. Being exposed again to the atmosphere the board takes in moisture and expands. Because it is now attached at the edges, the board is pushing against itself – eliminating soundboard cracking.



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Tuning Pin Block

Most manufacturers use a tuning pin block made of anything from 10 to 15 laminations of timber. Many technicians feel that this system surrounds the tuning pins with too much glue. Yamaha uses only three layers of timber between each of which is a moisture barrier – to prevent moisture passing from one part of the pin block to another. The result is a pin block which is far less susceptible to changes in atmospheric conditions and therefore provides greater tuning stability.

Tuning Pins

Yamaha tuning pins have lathe cut threads which are far superior to rolled threads. They are produced in machines designed and built by Yamaha. The threads are cut in such a fashion that thousands of minute teeth are created. These teeth are set so that the pin can be turned easily one way, but tend to lock in the opposite direction, thus improving tuning stability.

Centre Pins

Every piano action employs about 330 movable joints. These joints are made by drilling a hole through two arms of a wooden flange and gluing felt bushes into the holes. A centre pin is inserted through the bushes. When the centre pin is attached to an action part, the flange can move freely. Yamaha's centre pins are coated with a revolutionary chromium compound which virtually eliminates wear, thus cutting substantially service costs.

Flanges (Action Hinges)

A major problem occurs when drilling centre pin holes in flanges. Because timber is harder in some places than others, the drill tends to weave its way through the timber leaving the hole a fraction out of alignment. These fractions when transmitted 15cm along a hammer shank, depending on the size of the error, can be magnified to over 1mm, which must be compensated for. Most manufacturers assemble the action and then adjust the flanges by packing behind each one with a different thickness of paper. Checking and packing 330 flanges individually is a very time consuming process. Yamaha has designed and developed a machine which makes, drills, and assembles flanges automatically. The flanges after completion are held by the pin in a device which measures the angle of deflection of the centre pin. Each flange automatically drops into a tray with its equals. Flanges are then packed before being assembled onto the action rail. The result is a significant saving in action assembly time and a much greater degree of accuracy.



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Action Rails

Hammer rests and beam rails in pianos are traditionally made of timber. Yamaha uses aluminum, which has several advantages. To a large degree the regulation of the action depends on these rails remaining perfectly straight. A timber rail about 140cm long and only about 50mm thick, can be greatly affected by temperature and humidity changes, and tends to twist over a period of time. These changes do not affect aluminum rails, so regulation remains stable for far longer periods. Aluminum is lighter, stronger and more economical to produce.

Pedal System

Piano pedal systems have been a piano technician's nightmare for decades – producing squeaks, rattles and being difficult to adjust. Yamaha's system of steel rods, nylon bushes and butterfly nut adjustments is the first no-maintenance pedal system.

Different Pianos for Different Conditions

Yamaha is the only manufacturer which makes three different types of pianos. The parts of each piano (particularly soundboards and tuning pin blocks) are seasoned to contain a certain amount of moisture, thereby suiting the various climates of the 110 countries to which Yamaha export. All Yamaha pianos exported to Australia are seasoned for a super-dry climate. No problems occur moving these pianos to a humid part of Australia since the soundboard will only absorb more moisture and slightly increase the crown. However, moving a piano seasoned for a humid climate to a dry climate can result in the soundboard cracking and tuning system failure through loss of moisture.

SUMMARY

The Yamaha Corporation was founded in Hamamatsu, Japan in 1887, by Mr Torakusu Yamaha, and was the first company in Japan to produce pianos. Research and development of the techniques and processes described here have led Yamaha to become the world's largest manufacturer of pianos.

