



PRE-OWNED

LINEAR ACCELERATOR

Buyer's Guide

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CONSIDERATIONS FOR BUYING USED

If you want to choose the right linear accelerator for your budget and clinical needs, you have come to the right place. We created this Buyer's Guide to help you sort out the steps needed for your next equipment project.

When is purchasing a used linear accelerator a good idea?

Purchasing a used linear accelerator system is not recommended for every facility. New equipment is more often a better solution for many customers. If your center requires the latest technology available in the market today, or if you are planning on installing a machine that will not be replaced for a longer period of time (at least in the next 10-15 years) then a brand new machine, or an almost-new machine, is often the better choice.

However, it's important to note that unless a linear accelerator was installed in the past week, it's already a "used machine." This means that virtually every linear accelerator system in operation today is already used.

Used linear accelerator systems may be suitable for customers that fall into these circumstances:

1. If you are **treating few patients** (less than 8 or 10 per day, as a general rule) and may not have the revenue to sustain a more expensive machine.
2. If you live in a country or region where **reimbursement rates are low** and you are a clinic that must operate profitably to exist (vs. a public clinic that is not concerned with profitability).
3. If you will be using the linear accelerator in a limited manner, without the need for all of its technologies. For example, if you are treating pets or other animals and do not require advanced technologies, such as in the **veterinarian or research** fields; or if you are using only electrons to treat skin cancer for humans; or even if you are using it for **non-medical, industrial** purposes to image materials.
4. If you intend on buying new, more expensive equipment and technology in the next 4-7 years, but cannot afford it now and want to **build up the revenue base** of the practice.
5. If you are starting a new center and **do not have a lot of capital** or cannot secure financing to cover the costs of a new machine, or if you don't have a clear understanding of patient volume just yet and want to wait.
6. If you have only one linear accelerator in your center, **need to move locations**, and can't afford to have any down time.
7. If you want a **backup machine** to protect your practice in case the main linear accelerator becomes inoperable or must be replaced.
8. If you need a **temporary solution** while your new center is being built.

When given the option, most buyers would elect to buy a brand new, state of the art linear accelerator with the latest treatment technologies. But with the realities of economics and current political policies, this is not always possible.

Purchasing used equipment may not necessarily lock your facility into operating dated technology. Newer machines often make it into the used equipment market, offering customers the ability to acquire the latest technology at a more affordable price. And many machines are also upgraded over time, as most original equipment manufacturers, as well as some third party manufacturers, offer upgrade platforms for used systems. Besides, many brand new machines are sold without the latest technologies as well.

Used equipment is often a good strategy when building a new center. Many of ROS's customers that initially purchased used equipment to build or start a radiation oncology practice, have later gone ahead to purchase brand new systems. In fact, the first-ever Varian Unique Linear Accelerator system sold in the Americas was sold to a customer that ROS helped launch with affordable, refurbished equipment.

WHAT SHOULD I CONSIDER BEFORE DECIDING ON A PURCHASE?

Before you purchase a used linear accelerator, it is important to consider a variety of factors.

- How long do I intend to keep it?
- What are my unit energy sources?
- What is my current vault space and shielding?
- What are the hardware and software options I need?
- What manufacturers do I prefer?
- What are the service and maintenance options available to me?
- Am I selling or replacing existing equipment?
- Do I want accessories and upgrades?

Careful planning can maximize your investment dollars while still providing patients with quality treatment options.



LOW ENERGY VS. HIGH ENERGY VS. ELECTRON ENERGY

A linear accelerator (LINAC) uses microwave technology to accelerate electrons in a waveguide, which then allows these electrons to collide with a heavy metal target. High-energy x-ray photons are produced as a result.

INTERESTING FACT

Varian brought in the experts at BMW Group DesignWorks USA to design a less intimidating linear accelerator for its line of high-energy X-ray machines.

The result is the Varian TrueBeam.



"Low-energy linacs" are those that can produce a maximum of 6MV photons.

"Mid-energy linacs" produce up to 10MV. "High-energy linacs" produce 15MV photon energies and higher. The MV energies utilized will determine how deeply the radiation beam can treat the tumor inside the body. A higher photon energy will penetrate and treat tumors deep within the body.

Electron energies are used primarily for superficial or skin tumors and do not penetrate deeply into the body, making them a preferred tool for dermatology and skin cancer treatments.

SOFTWARE AND HARDWARE TERMS

MLC (Multi-leaf Collimator)

EPID (Electronic Portal Imaging Device)

IMRT (Intensity Modulated Radiation Therapy)

OBI (On-Board Imaging): KV Imaging Device -- Only Varian

XVI: KV Imaging Device -- Only Elekta

IGRT (Image Guided Radiation Therapy)

CBCT (Cone Beam CT)

SRS (Stereotactic Radiosurgery), SBRT (Stereotactic Body Radiosurgery)

VMAT (Volumetric Arc Therapy)

HARDWARE COMPONENT OPTIONS

MUTLI-LEAF COLLIMATORS OR MLC'S

Since the early 1990's, technological advancements have led to the addition of various components that have improved the precision, speed and targeting of tumors:

An MLC is a device that is affixed to the collimator of the linear accelerator system. It contains several sets of metallic leaves, that when open and closed, can shape the beam of radiation as it exits the linear accelerator.



MLCs are found on virtually all linear accelerator system sold today, and many machines that were manufactured without MLCs have since been upgraded to MLC. Having an MLC on a linear accelerator eliminates the need for using block cutting devices to produce beam shaping effects. MLCs are particularly useful when treating patients using IMRT (Intensity Modulated Radiation Therapy).

PORTAL IMAGING DEVICES

A Portal Imaging device (often referred to as an EPID or electronic portal imaging device) is a device that extends and retracts from the foot of the linear accelerator. It is used for Quality Assurance by physicists in order to test the linear accelerator and its beam. It is also used for patient positioning and to perform IGRT (Image Guided Radiation Therapy).

Portal imaging devices work, when extended in the out position, by producing an image when its detector panel is hit by the photon beam emitted from the linac. The EPID uses a detector panel that captures and digitizes the image of either the patient (when used for positioning or IGRT) or the phantom (when used for QA).



*Portal imaging device
on Elekta linear
accelerator.*

KV-IMAGING DEVICES

A KV-Imaging Device looks like right and left “arms” that extend from the gantry of a linear accelerator. One arm contains an x-ray tube, and the other arm contains a detector.



KV imaging system on a Varian linear accelerator.

When the gantry of the machine, and its arms, rotate around the patient, images can be produced of the tumor. This device allows for much higher quality images than the EPID device can produce. It also allows not just for IGRT, but also CBCT (Cone-Beam CT). And with the right hardware and software upgrades, a KV-Imaging Device can also be essential in performing VMAT (Volumetric Arc Therapy).

Varian and Elekta each have unique brands for their respective KV-Imaging devices. Varian's is called the “OBI” or “On Board Imager.” Elekta's is called the “XVi.” Both perform the same function.

BEAM STOPPERS

A beam stopper is a device that is used to replace the foot of the linear accelerator, where the EPID is normally found. Beam stoppers are constructed of steel and are used to provide additional shielding for the machine, when vault shielding is not sufficient. Very few, if any, newer machines are manufactured with beam stoppers. Beam Stoppers are often used in older vaults that were originally constructed to have cobalt-60 radiotherapy machines.

LINAC MANUFACTURERS

Current radiation therapy treatment manufacturers include Elekta, Varian, Accuray, Brainlab, and Shinva. Varian has by far the largest market share of linear accelerators in the U.S., followed by Elekta. Siemens linear accelerators are still widely bought, sold and installed in the secondary market, although Siemens stopped manufacturing the devices in 2011, when it elected to exit the radiation therapy business.

We have compiled a list of popular linear accelerator systems that are currently available on the secondary market.

ELEKTA PRODUCTS

VersaHD - all the capabilities of the Axesse, the VersaHD delivers 3 times the dose rate while maintaining increased precision.

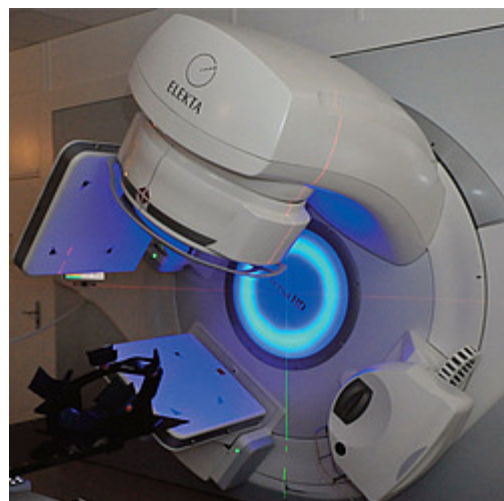
Axesse - a completely integrated solution for SRS/SBRT combined with full featured versatility.

Infinity - all the same imaging and treatment delivery capabilities of the Synergy, the Agility 160 leaf multi-leaf MLC is introduced for even more beam precision.

Synergy S - designed with a focus on SRS-Stereotactic Radiosurgery and SBRT-Stereotactic Body Radiation Therapy, but with same IGRT/CBCT/VMAT capabilities as the Synergy.

Synergy - first of Elekta's linear accelerators to provide IGRT, CBCT & VMAT with the development of its XVI, KV-Imaging Device.

Synergy Platform - has all capabilities of the Precise plus the prerequisites required for an upgrade to XVI (i.e. Synergy).



Precise - a fully digital solution with multiple photon/electron beams, 80 leaf MLC and iView-MV based portal imaging system delivering both 3D and IMRT treatments.

Compact - designed for simplicity and high volume throughput. Has a smaller footprint enabling installation where vault space is limited, but with similar capabilities of the Precise (Note: sold only in select markets).

SL Series (15,18,25,75/5) - original Elekta design with basic photon/electron beam delivery and upgradeable to Precise.

VARIAN PRODUCTS

Edge - Varian's integrated solution for SRS and SBRT.

TrueBeam STx - combines BrainLab hardware and software further advancing stereotactic abilities and treatment accuracy.

TrueBeam - fully digital system with ultra high, adjustable dose rates, 3 photon energies, and the 120 leaf HD-MLC for increased precision (i.e. SRS/SBRT).

Trilogy - essentially a 21iX, with a higher dose rate for SRS/SBRT

Clinac 21/23 iX - with a focus on IGRT, this accelerator if fully loaded comes equipped with OBI, CBCT and RapidArc/VVMAT.

Clinac 21/23 EX - one of the most commonly used linear accelerators, it comes equipped with 80/120 leaf MLC, IMRT and portal imaging.

Upgradeable to OBI, CBCT and RapidArc/VVMAT.

Clinac 21/2300C/CD - reliable dual photon high energy accelerator with electrons. Upgradeable to an 80 or 120 leaf MLC and portal imaging, this system can delivery 3D and IMRT treatments with precision.

Clinac 600C/CD/EX - can be used in smaller vaults , this is a low energy 6 MV photon accelerator with no electrons. Upgradable to MLC, IMRT and Portal Imaging.

ACCURAY PRODUCTS

Cyberknife (G4, G5, VSI & M6) - the first and only non-evasive robotic surgery designed linear accelerator specializing in SRS/SBRT.

Tomotherapy (Hi-ART, HD, H series, Direct & Helical) - leading technology that combines a 6MV linear accelerator system with CT imaging capabilities allowing daily precision for 3D and IMRT treatment delivery.

SHINVA PRODUCTS

The **XHA600D** is a Chinese-manufactured, low-energy linear accelerator and consists of the machine, treatment couch, and control system.

SIEMENS PRODUCTS

Artiste - the last and most advanced linac manufactured Siemens, typically equipped with 160 leaf MLC, IMRT and MV based CBCT for IGRT (i.e. M-Vision).

Oncor - an upgraded MLC to 82 leaves combined with a new portal imaging system (i.e. OptiVue 500/1000) and the option of M-Vision CBCT launched Siemens' MV based IGRT.

Primus - development of the 58 leaf MLC and BeamView portal imaging helped introduce IMRT.

Mevatron (MD, KD, Mev 6740) - offering either a magnetron or klystron source these linacs include one to two photon energies for 3D conformal treatment delivery.



*Comparison charts for used Varian, Siemens and Elekta linear accelerators can be found on our **website**.*

WHAT ARE MY EQUIPMENT REMOVAL OPTIONS?

Is your facility considering selling or replacing diagnostic imaging or radiation therapy equipment? There are several options to choose from. We have highlighted the “pros” and “cons” of each.

OPTION 1: SELL YOUR USED EQUIPMENT

Who doesn't like 'cash in hand'? By selling your equipment you will have the benefit of knowing how much your used equipment is worth.

Pros of the Selling Option

- Receive the maximum cash value for the equipment.
- Cash payment provides value and flexibility. Use the funds in any area of your department.
- Extends the life of equipment by placing it in areas where it is needed, since most Buyers' will re-use or recycle the equipment.
- Humanitarian value when equipment is used in developing areas of the world, which is where much recycled equipment is used.

Cons of the Selling Option

- Requires inspection from the purchaser of the equipment.
- Requires gathering information and service history, taking photos, etc.
- Requires the equipment to be complete and usually in operational condition.
- The proceeds of the sale are often kept by the hospital's general fund and not retained by the department.

OPTION 2: CONSIGN YOUR USED EQUIPMENT

Some sellers choose to consign their equipment, which allows them time to find the “right” buyer.

Pros of the Consignment Option

- Frees up space quickly. You can have your equipment removed without going through the longer sales process.
- More time to market and sell often yields a higher price and more value recovered.
- Hiring a qualified company to work with will make the process seamless. Equipment ages and loses value the longer it is stored.

Cons of the Consignment Option

- Some equipment often loses value after it is de-installed.
- There is no guarantee of whether it will sell at the price you want.
- Equipment ages and loses value the longer it is stored.

OPTION 3: REMOVE AND DISPOSE OF YOUR USED EQUIPMENT

A removal and disposal is sometimes the only option to choose if your equipment has low or no value on the secondary equipment market.

Pros of the Remove and Dispose Option:

- Opens up space that can be used for other equipment, offices, storage, conference rooms, etc.
- Eliminates liability and risk of older equipment sitting around.
- Often allows your building to be sold with fewer complications.

Cons of the Remove and Dispose Option

- Removal companies will charge a fee to professionally remove your old equipment.
- Can be dangerous and requires skilled professionals to remove safely.
- There is a chance you will need the equipment at a later date.

OPTION 4: PART-OUT YOUR USED EQUIPMENT

Cash payment for individual parts can often help offset or even completely cover the costs of removal and disposal of the old machine.

Pros of the Part-out Option

- Some value (vs. no value) can be recovered from the equipment by selling its parts first, before disposal.
- Some parts may be used to support your older units and lower service and maintenance costs of those units.
- Parts can often be used to reduce cost of removal and disposal.
- You may be helping medical facilities in developing countries with your used parts.

Cons of the Part-out Option

- Equipment's service life ends when machine is disassembled.
- Removal and disposal services are still required to remove the rest of the equipment.
- Parts-only machines tend to have little residual value.

OPTION 5: TRADE-IN YOUR USED EQUIPMENT

A trade-in, as the name implies is the replacement of an older piece of equipment with a newer, more technologically advanced, new or refurbished system.

Pros of Trade-in Option

- Reduce downtime by swapping out machines simultaneously. The old machine comes out immediately before the new one is installed.
- Upgrade to new technology, using the value of your old machine to cover some of the costs.
- Reduce time by wrapping everything into one transaction with one party – eliminates the headache of dealing with several parties.
- Allows budget dollars to be applied to the department's equipment vs. the general hospital fund. Therefore, your department retains the trade-in value.

Cons of Trade-in Option

- Value of older equipment may not be significant, so the trade-in allowance may be negligible.
- Selling your older equipment on the secondary equipment market may provide more value than a vendor is willing to provide on trade-in.
- Discounts from trade-in equipment are often overstated to make the new system quotation appear more attractive. Many of these discounts can be negotiated anyway.

OPTION 6: AUCTION YOUR USED EQUIPMENT

An auction is a great method to ensure maximum sales price of used equipment, assuming the auction is highly targeted to qualified buyers.

Pros of the Auction Option

- Greater exposure to a larger audience of buyers. Increased competition can result in a higher price.
- The sales process is completely transparent to the seller, so you know who is offering what for your equipment.
- Auctions are good for large volumes of sales, or sales in large lots, especially for lower priced equipment.

Cons of the Auction Option

- There can be time constraints. The auction process is limited if buyers require more time to gain approvals and secure financing.
- Opens the buying to non-professionals, which can pose great risks when removing equipment.
- Auctions are generally not very flexible and may not allow for equipment to be inspected at the appropriate time(s).

ROS is here to help make the most of your decision to sell or replace your used equipment. If you are ready to find out how much your used equipment is worth, we can provide you with a **fair market valuation**.

FINAL THOUGHTS

We hope that you found the information in this Buyer's Guide useful as you plan for your next LINAC project.

To request an appraisal for your current equipment or a custom price quote for a replacement or new, refurbished machine, please email info@oncologysystems.com or call 858-454-8100.

Be sure to also check out our Blog, which contains resources, tips and insights from our equipment and project experts.

READY FOR A QUOTE ?

SUBMIT YOUR CONTACT INFORMATION
TODAY AND A ROS SPECIALIST WILL
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