January 2011

MURAKAMI

Technical Newsletter

MURAKAMI SCREEN U.S.A., INC. *745 Monterey Pass Rd. Monterey Park, CA 91754 Tel 323.980.0662*

Stretching Screen Mesh

The most important part of the screen printing process involves how your mesh is tensioned. The common school of thought is tighter is better. Quite often a 'ballpark' figure is used, 'I stretch all my screens to 30 newtons.' Lets look at this to determine if it is a 'best practice.' Best practices for one shop could spell disaster for another, it all depends on a shop's presses, personnel, and other factors as we will see.

Let's start at a mesh guide. Here is the link:
http://www.murakamiscreen.com/documents/MeshGuidefromCatalogweb.pdf
Not all mesh should be stretched to a blanket statement like the one above. A mesh guide points this out. Look at the recommended tensions below for a 110T and 110S mesh.

Fabric No.	% Open Area	Thickness	Ink Volume	Tension
150-S	51	77	39	18-28
150-T	46	84	39	22-35
150-64	39	106	41	25-39
150-HD	34	111	38	28-44

Mesh tension capacity is a factor of the thread size used, the number of threads per inch and finishing techniques. Thinner threads require less tension than thicker threads, otherwise any rough handling of the screen will cause mesh to pop. Lower tensions applied to thinner thread doesn't affect registration when using Smartmesh like other import mesh. Smartmesh has mesh memory. The term in the past was low elongation which refers to how well the thread resisted stretching when under tension. Smartmesh's mesh memory takes this a step further to also resist the forces of the squeegee during printing even when lower tensions are used. So tension is one part of great prints, but the meshes' ability to return to the same location during printing results in non-stop printing with excellent registration for the entire run at a workable tension. That is key to long term screens. Selecting a 'workable tension' that produces great prints and a screen that won't explode under normal handling.

What is a Workable Tension for my Shop?

Ask yourself these questions first. These conditions are common to most shops, modifying them will help you improve screen life, or allow for more critical types of printing like simulated process where dot on dot register is required using finer meshes and if you want today's soft hand plastisol feel, finer threads.

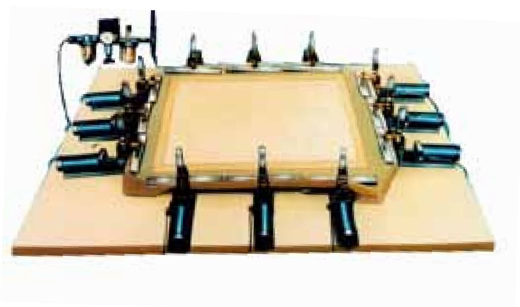
1. **How much off contact is normal for your press**? If you are at almost a quarter of an inch off contact to compensate for old untensioned screens you need to use lower tensions on new S mesh screens to avoid having the squeegee corners wear a hole in your screen that can cause a high tensioned 'S mesh' screen to explode. You can use a thicker thread to avoid this, but thinner S thread meshes produce softer, brighter prints with less ink due to the greater open area they provide over T and HD threads. Lowering off contact to 3/16-1/8" can allow you to use higher tensions and not cause the mesh to wear. Also round off the corners of your squeegee ends to prevent excess wear on S mesh.

2. **How do your employees handle screens?** If they stack them against a wall and kick the bottom to straighten them up, or handle them two by two and drop them to the floor, or toss them in a sink letting the corner of the frames bounce against the mesh, you need low tensions from the guide. If you want to stretch to a higher tension you need to handle high tension screens carefully, especially S mesh screens. Use screen racks where possible to transport screens. Screen rooms, especially reclaiming, need procedures to protect mesh, not abuse it through rough handling.

3. **How do your employees set up screens on press?** To often during set up squeegees, flood bars, and clips are dropped onto the screen and then attached to the print head. Burrs, screws, and bolts sticking out may not pop a T thread, but they can pop an S mesh that is stretched to the highest tension possible.

4. **During breakdown are squeegees, floodbars, and clips dropped into the screen?** Like the set up area mentioned before, these items can contain sharp edges that can pop screens.

5. **What is the condition of your stretcher?** Too often the condition of stretchers is poor. Glue is allowed to build up on retaining bars and the stretcher bar which creates sharp edges to cut mesh. Also the air manifold that directs air to the stretch cylinders can be broken causing more air to go to one set of bars than the other leading to screens popping before the desired tension is reached.



As we can see to achieve working tensions, screen handling, the stretching method and device condition are critical.

The next question is how high a tension do I need to create great prints? Surprisingly it is not as high as you think. There is a lot of myth about high tensions. Quite honestly unless your press is set-up perfectly super high tension screens are not easy to print with. Remember Smartmesh can print dot on dot register at the lowest tension level from the Smartmesh guide due to proprietary thread technology that retains tension rather than lose it on each job it prints.

A good working tension is one that creates excellent prints, sets up easily, and ***preserves the life of the mesh***. Working tension takes into account how your shop; stretches mesh, handles screens in pre-press and post press, and how much off contact your press is set to.

Stretching Mesh

There are a variety of stretchers available, from manual systems to pneumatic bar stretchers, to multiple clamps, to a Newman Roller Table. In all cases the condition of the stretcher determines the working tension for your shop.

1. **Manual an Pneumatic Bar stretchers:** The two most common problems are build up of super glue on the retaining bars and on the stretching bar that the retaining bars fit into. All edges need to smooth, free of burrs, glue, so that S mesh and mesh above 160 are not damaged. The better the condition the higher the tension possible. The other area is the air manifold that directs air to the control valves. If the manifold is bad it will direct more air to one set of bars than the other causing unbalanced tensions and screens popping. Pre-soften the corners to avoid corner tears.

2. **Multiple Clamp Stretchers:** In addition to the issues discussed above it is important that stretchers with multiple clamps be zeroed out so they have maximum cylinder travel (especially on large frames) and most importanty they line up without 'pinching' the mesh threads between clamps. Like above, pre-soften the corners to avoid corner tears.

3. **Newman Rollers:** All retaining strips and channels need to be free of nicks, burrs, breaks, and rough edges and dents. On the plastic strips use new strip or use 600 wet and dry sand paper to keep them smooth.

4. **Newman Roller Stretch Tables:** As these tables and frames wear a multitude of problems can occur that can go unnoticed by the operator and cause screens to pop. The frames over time get gummed up where the cylinder/roller meets the corners. This prevents the cylinders from turning and if one binds up on one end the other will overcompensate and turn more. This is crucial: Both cylinders need to turn at the same time for the same amount, whether on the stretch table or doing it by hand. When only one cylinder turns it is curving the mesh, creating pinch points that will cause mesh to break.

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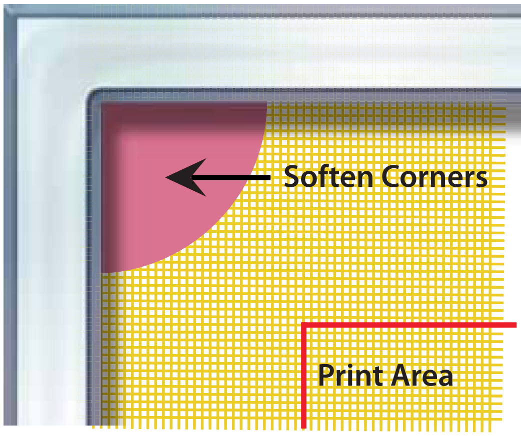
Stretching Mesh:

Mesh is stronger and achieves more stable tensions when stretched perpendicular to the frame. If the mesh capture method or equipment pulls unevenly the screen will not be as strong. The screen may not have any issues when stretched but when squeegee force is applied, or too much off contact is present then poor stretching may pop up. (pun intended). Basic rule of thumb is the better aligned the threads are to the frame the more stable the mesh will be. A screen stretched to 25 newtons with a perpendicular orientation will last longer than one where the threads may curve due to stretching equipment, or due to improper capture technique that creates angles. Pinch points at the knuckles occurs when mesh threads are not perpendicular to the mesh and can break if over tensioned or used on a high off contact press.

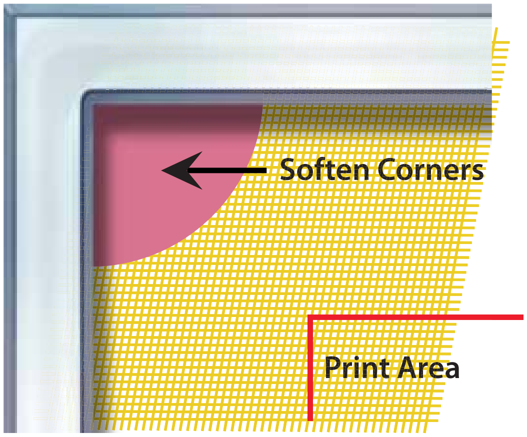
Stretching on an angle isn't necessarily bad. Before RIP programs allowed every angle possible 4/C process screen mesh was stretched to an angle like 22 or 61 degrees to eliminate moire. Today we output the positive with these angles, but is possible to stretch on the 'bias'. Just remember to lower tension slighlty to prevent excess stress on the knuckles.

The most common issues with stretchers:
1. Glue on the capture bars, strips, or frames.
2. Poor capture of mesh, keep it perpendicular to stretch direction.
3. Uneven clamps, air manifolds, or manual methods.
4. Creating unseen pinch points with your stretch methods. (Try drawing a light pencil line on your mesh with a dull #2 pencil so you have a visual line up to capture finer mesh that can be hard to see. A light table helps to see this.

Optimum Thread Direction: Perpendicular to the frame



Angled Mesh needs lower tensions to prevent breakage.



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Pulsing Mesh to achieve more stable screens

'Haste makes waste' comes to mind, but for a screen maker under pressure and production managers eyeing the clock to meet a deadline, screen makers opt for speed. Nothing could be worse for your screens and your bottom line.

Time to get back to basics. First off, speed kills. Stretching mesh quickly takes it from a no stress state to a critical high stress rate instantly, especially if you insist on high tension screens. Mesh needs to respond to the tension stress in incremental levels to achieve a stable stretch. Like running a track race you don't go out and knock off a quarter mile at full speed and not expect to pull a muscle. Rather runners stretch, and restretch muscles to limber up tight legs, to warm them up. This is a concept that screen makers need to employ. Mesh is composed of many thin threads that by themselves break easily. The strength of the mesh is brought about by the weave and having many threads handle the load. Stretch them too quickly and one or two will complain about it and break, often causing the entire mesh fabric to rip simultaneously.

The threads only work when they are all happy, none are getting pinched, they are all straight, and they all have even tension. Get a bunch of them unhappy and they won't accept the strain and will pop your screen at the worst possible time.

What tension for Pulse Tensioning?

Let's say my shop uses 3/16th' s of an inch off contact, which is good for my athletic heavy laydown, spot colors, as well as my sim process printing. Any lower and thicker t's with athletic ink would not lay down well, and any higher would require even less tension. The Smartmesh mesh guide tension levels for 150/48 S mesh is: 18-28. You would be amazed at how many printers dismiss these tensions and flatly state: 'I stretch all my screens to 30'. In that case your 150/48 S mesh screens will pop, guaranteed. Tension levels vary for every mesh count and thread type. Don't believe me? Look at our Smartmesh guide, those tension levels shown are optimum, no more, no less. The upper number, 28 is a maximum tension. So capturing the mesh at an angle, or curving the mesh at this tension will create pinch points and cause mesh to pop. Rather select a tension level mid way, say about 23-25 newtons. This tension level elimnates popping from poor capture and some rough handling of screens. (The better the screen handling practices the longer the screens last, period).

Those of you who don't use Smartmesh on static stretch and glue be prepared for radical loss of tension. 5-7 newtons the first day, another 3-5 after the first print, and a couple of newtons on jobs therafter until there is almost no readable tension. Smartmesh has different threads, proprietary threads only Smartmesh has. They resist elongation the moment they are glued down, and every job thereafter. A well stretched Smartmesh screen at 25 newtons can balance out at 19-22 newtons after printing and retain a high printable tension for the life of the screen.

Stretching tip: *Tension the longest dimension of your frame first to about 2/3 the desired stage tension (see next page), then stretch the narrow width of your frame secondly until it reaces the target tension. Check both directions using a tension meter and adjust accordingly. On some textile presses companies are trying to maximize print area with wider squeegees. If your squeegee is within 1.5 inches to the edge of the frame I recommend dropping the tension on the narrow direction of your frame by 2 newtons in the final stretch. This will prevent the corner of your squeegee from creating a momentarily higher than recommended tension when it comes down to begin it's print cycle.*

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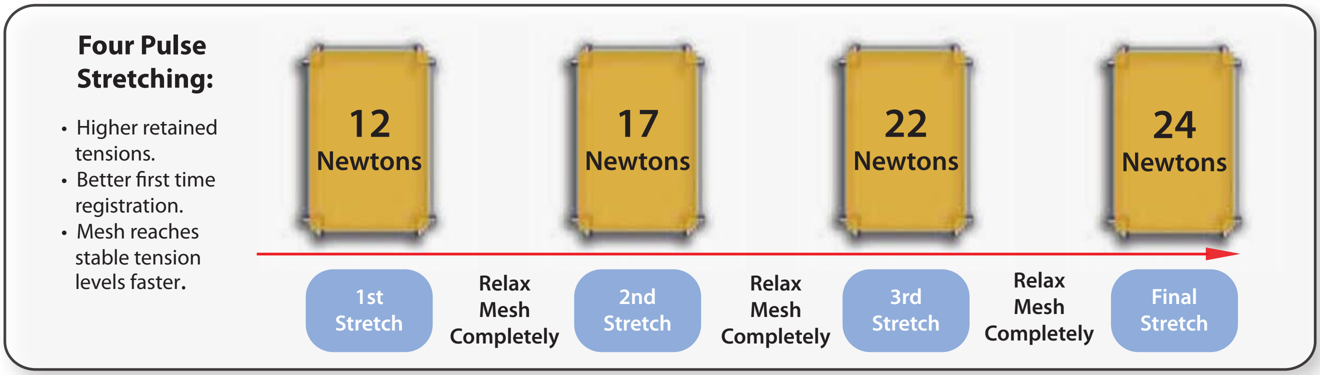
Pulsed or Staged Mesh Stretching with Smartmesh from Murakami



First inspect your stretcher and frames before every stretch and eliminate old glue, burrs, dents in frames or anything that isn't smooth for the tensioned mesh to glide over. Those thin threads need smooth surfaces when under tension, one nick in a thread can cause the whole screen to pop if it can't handle the tension and it's share of the load. Also make sure the air manifold distributes air evenly, or if using Newmans that opposing rollers turn simultaneously.

Secondly capture as close to perpendicular as possible so the stress is on the thread and not on a knuckle.

Third, use the air regulator knobs! DO NOT flip the air switch on sending a rush of air through the air regulators. This will jolt the mesh quickly and can instantly pop mesh. Go back to our running example. Not only didn't the runner get a chance to stretch, he was jolted out of bed at the sound of the starting gun. It's not going to be his best race and he will pop a hamstring in the process.

Rather we are going to assume your mesh is at room temperature 72 degrees or more, the molecules warm within the threads and enough to slow molecules down. Mesh at room temperature stretches better. Also make sure to use a functioning tension meter that has been calibrated with the piece of glass that comes with the tension meter.

The graphic above shows a four step process. The time needed at each stage doesn't have to be very long. You can hold tension on newmans with the wrench, or bleed off air with air regulators until you see the mesh lose tension. Once the mesh has relaxed perform a second stretch, relax the mesh again. Continue doing this until your upper tension is achieved. Each mesh will have different intervals, normally 5 newtons apart with the last stretch a couple more over the third stretch.

If your air regulators don't bleed more air to the cylinders you can allow the mesh to stay at the highest tension for 30 minutes, then adjust back upwards to the target tension. Using the four pulse method or stage stretching achieves a semi work hardened screen that will lose the least amount of tension.

Taking the time to stretch a stable Smartmesh screen now keeps your jobs running non-stop, provides excellent dot on dot register from screen to screen, and retains more tension, especially when using Smartmesh, the best mesh you will ever print with.

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Smartmesh