

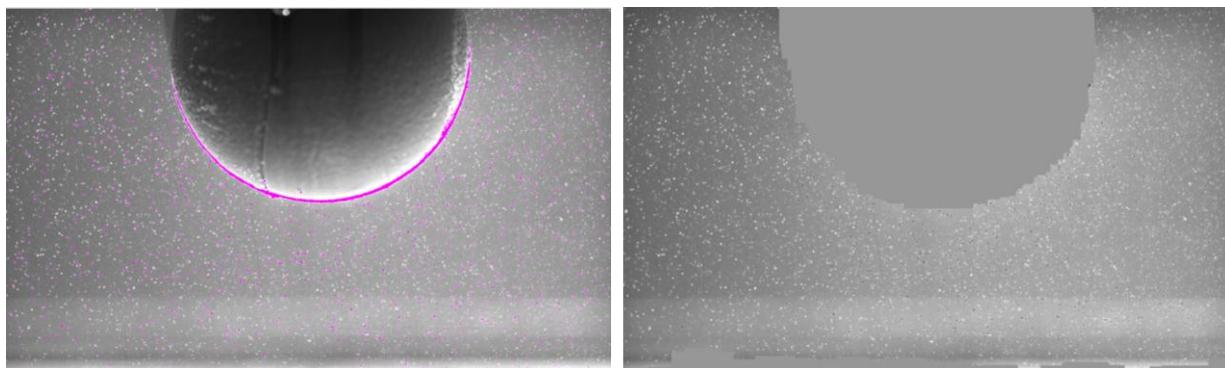
DYNAMIC MASKING FOR PIV IMAGES

APPLICATION NOTE PIV-018 (US)

In complex fluid flows, time-stationary or moving object(s) can be found in a PIV image. Some examples include the flow around an airfoil, flow around a moving fish, or the flow field inside a piston-driven engine. Unfortunately, the object(s) occupying the image can adversely affect the PIV processing of an entire image, and so it is always recommended to have the object(s) removed.

Stationary or moving object(s) inside the flow field commonly have laser reflections along their edges and strong intensity gradients within the object, which generate erroneous vectors. It is pertinent to have the object(s) taken away so the processing of the entire image will only generate a vector field that is truly representative of the image. When higher order statistics are required, an accurate vector field is important, as any erroneous vectors will provide incorrect results.

The Dynamic Masking algorithm is designed to isolate any stationary or moving object by generating a mask for each object from the original image ensemble. Subsequently, PIV processing does not take place within the masked regions for internal flow cases. The dynamic masking algorithm can be applied to steady-state PIV with stationary object(s) and time-resolved PIV where object(s) are moving in time.



Right: Raw PIV image. Left: Dynamic mask with high intensity pixel values on edges masked out.

How to Apply Dynamic Masking in Insight 4G™ Software

To apply a Dynamic masks, access the “Process Masks” menu and select the “Dynamic” tab. The image processing techniques employed create a gray scale image that is viewed by default. When the object to be masked is obvious in the gray scale, simply set the threshold at the proper pixel intensity and select “View Mask” to preview the dynamic mask.

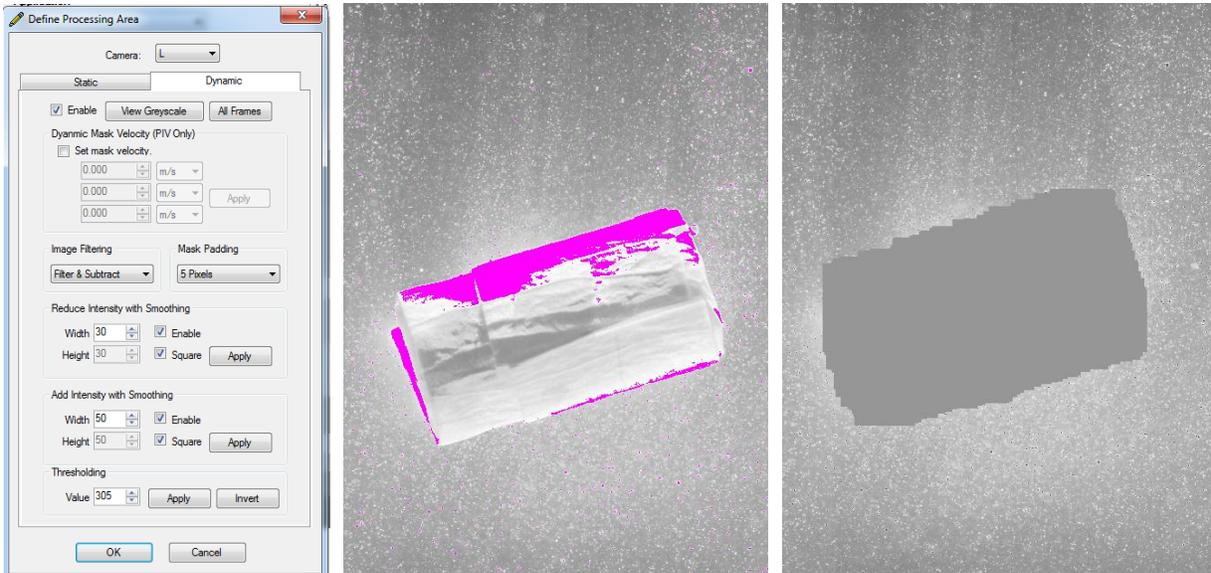
Dynamic masks are created during processing, Insight 4G software’s Dynamic Masking algorithms require very little processing time. Insight 4G software also outputs the Dynamic Mask as a convenient viewable bitmap image.

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Dynamic Masking Setup

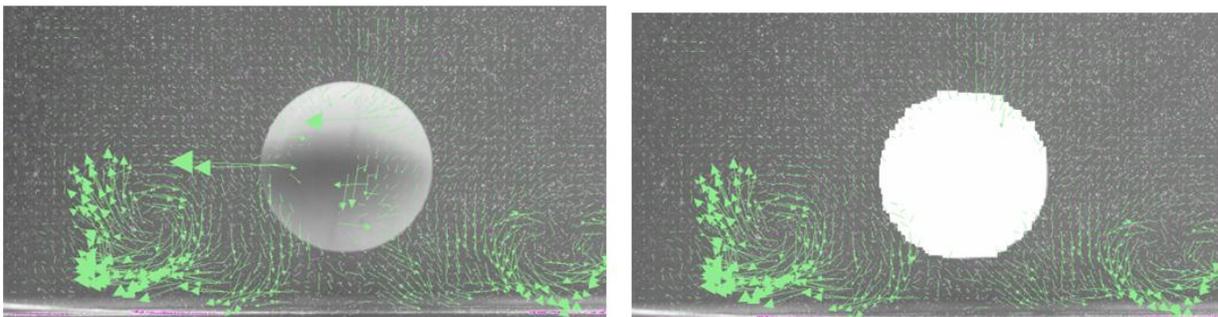
Dynamic Masking in Insight 4G software is robust enough to handle objects with complex shapes and textures, but also simple enough to operate for quick, accurate masking results. The dynamic masking setup menu (shown below) allows the user to modify parameters that govern the Dynamic Masking algorithm and receive instant feedback.



Left : Dynamic Masking Setup Form; Center: Raw PIV image; Right: Corresponding dynamic mask.

Dynamic Masking Effect on PIV Processing

Once a dynamic mask is applied to the PIV image, non-physical vectors (due to large intensity gradients on or near the object) are removed. Since the objects to be masked can come in a variety of shapes and sizes, it is sometimes possible an interrogation window will contain both particle images and a dynamic mask. To help retain as much information about the flow as possible, the Dynamic Mask also receives an average pixel intensity so that correlations near object boundaries are preserved.



Dynamic masking removes large, non-physical vectors in masked regions.



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