Hello everyone,

In this tutorial we will be taking a look at creating convincing and realistic looking metallic materials as shown in the sample picture above. While I have used Vray to create the materials, the same concepts can be easily applied to other renderers and / or materials.

I will not be focussing on the parameters I have used in this particular material as they are very specific to VRay, but more on how I set up the material and why I used this method.

To be able to grasp and translate the concept of this tutorial you will need to have a fundamental understanding of what materials are, how to set them up and what a render engine is. Knowing how to operate your render engine is of course essential to produce quality renders, but since that’s not within the scope of this tutorial I will not go into that.

Now, let’s have a look, shall we? 😊
Overview of the materials and why I use them the way I do

First, let me show you the layout of the material and explain a little why and how I used certain material types so you understand the concept and can translate them to other render engines.

As you can see I'm using compound materials or VRayBlendMtl as they are called in Vray. In Mental Ray this would be a mix map. It's a material type that allows you to blend / mix several different materials, which you can then apply to the model as one material.

This allows you to for instance take a bitmap texture and mix it with a dirt map + color to rough up your clean texture. Or you could take several bitmap textures and blend these together to get much more detailed surfaces.

I use Blend maps a LOT, mainly because it allows you to create one base material, make several copies of it, add different detail on each one and create randomness on your models. Ideal if you have a copied / instanced / cloned model and want to have uniform textures on them (the one you've painstakingly painted in PhotoShop) and give them some 'character' of their own. This will greatly add to the realism of your renders.

Of course these are just some of the many many possible (endless?) implementations of blend materials. For instance in the sample pictures in this document, note how I have also used a blend material (with color and noise maps) for the ground plane and how this breaks the even color you would normally get from a basic color material. It's very subtle in the green background. Hardly noticeable until you remove it! In the red background the effect is somewhat clearer (the white 'dusty' look).

The sub material layers of the VRayBlendMtl consist of the Base, which is basically the color, reflection and bump map information (a basic, one material setup so to speak). The Coat 1 and Blend 1 are the blended materials which (in this case) make up the color and noise to add 'dirt' to the shader.
The reason I’m using a blend material is because I want to add some discoloration and a dirty look on the cartridges. This can be easily achieved by blending the discoloration into the base material. Additionally I wanted the cartridge to have a more realistic look metallic and reflection wise. Therefor I added noise map to the bump channel of the Base material, as so to break up the surface. The adding of a bump map will also scatter the reflections you will get on the surface of the model, adding to the realism. You will see examples of this effect a little later on.

Now why am I using a Noise map for one material and a Smoke map for the other?

Noise and Smoke are basically the same parameter wise, but differ in their pattern. That's about it really. So the choice to use either one really depends on the result you want to achieve. Noise is good at bumpy, granular distortion, that's why I used it to create the "pitting" in the metal texture. Smoke is better suited for dust & stain patterns, so I used that one to create the "dirt" stains for the blend.

**General considerations**

There are a couple of basic things to remember when adding (reflective) materials to your models:

**Size of the objects**
You have to take the size of your model into consideration. To create a realistic look you will have to make sure the details aren't either too large or too small. They need to be just right. This can make or brake a model. Simply take a look at some real life examples to give you an impression of how the reflections look, what type of wear and tear an object has, the size and shape of distortion/damaged areas / scratches, etc. Personally, I always work in "real world" units. If a person is 1,80m tall I will create a model in Max that’s 1,80m tall. Working with real world units becomes important if you start working with f.i. photometric lights and other (lighting) systems that calculate based on these units.

**Geometry**
Although the subject on how to build your geometry doesn’t really come into play in this particular tutorial, it is of great importance how you model when using reflection and specular highlights with for instance metallic surfaces! So I will very briefly go over the most important thing to know, just to make you aware of this.

Please take a moment to study the following pictures and note the differences between the object on the left and the one on the right:
Note how the reflection and specular highlights on the object on the left are virtually non-existent, while
the object on the right looks nice, shiney and metallic. The object on the left looks dull and does not appear to have a metallic surface.

There’s only one difference between these two objects... I have chamfered the edges on the one on the right. Everything else is 100% the same (lighting, materials, base object, etc.). And this is the essence of building proper geometry for this type of material: chamfer edges! The reason for this is actually very simply. To get reflection / specular highlights from anything, it needs to have a surface to catch the rays of light and reflect them. A non-chamfered edge doesn’t have a surface. It’s just one line. So there will not be any reflection whatsoever. If you chamfer the edges, the line now becomes a surface and can reflects things. Simple, isn’t it? :)

Of course, in the pictures above I have exaggerated the effect of the chamfered edges, but it clearly demonstrates the effect.

Environment
With reflective materials one thing that will greatly influence the look of the model is the environment! Keep that in mind, it’s important! Reflections reflect things. Hence the name ;) The things they reflect are their surroundings. So if you’re setting up your material, make sure you have the basic environment in which they will be shown set up. Take a look at the following sample renders and see the impact a simple colored ground plane has on the reflections and final color of the material:

In the first two pictures the impact of an active environment may not seem all that big.
You can see some minor differences in the left and right shaded sides of the cartridges, but that’s about it. Now, let’s look at this from a different angle (note that the ONLY thing I’ve changed in these renders was the ground plane, nothing else!):
The first picture has NO environment whatsoever. I have hidden the ground plane. So there is nothing but blackness, nothing for the lights to bounce off of.

In the second and third pictures I have unhidden the ground plane and added a simple color to it. Note how the shaded areas of the cartridges are much more reflective and have more definition to them. This is because the rays of the lights are bouncing off of the ground plane onto the cartridges, which in turn reflect that color information. This can have a HUGE impact on the coloration of your objects and their overall appearance! Also note how the reflective colors are reddish in the third picture, to show it’s the environment influencing the reflections.

Since reflections are influenced by the environment, this means (as you have probably noticed) the only part of the object where the reflective colors change are the parts where the bouncing rays of light can actually reach the object’s surface. The colors on top of the cartridges are virtually without change. This is also why you couldn’t see much difference in the first pictures, since they were rendered from the top view. If I were to place a ‘roof’ (a plane with color above the objects) and have light bouncing off of that, the top surface color of the cartridges would also change dramatically because they would reflect the color information being dropped onto them by the bouncing rays of light!

Anyway, this is just a heads up. In the past I have had it happen to me where I had created a fantastic looking material, only to find out it totally didn’t work out in the environment I had it planned for ;)

The material

Basically it’s a fairly simple material. With the material in this tutorial I’m using a blend method to ‘break’
the surface of the cartridge so the reflections and overall appearance aren’t that clean and add some dirt to give them a used and real feel.

In the previous pictures I have been teasing you with renders of two cartridges side by side. One has a ‘broken’ dirty surface, the other is completely flat. There is a reason for that and we will come to that now 😊

If you look at real life items, you will notice nothing is entirely clean, flat and perfect in every way, even if they are brand new. There’s always some sort of distortion going on. Now, to create realism in our reflections, we have to take that into consideration too. This is why I have been showing you the two cartridges side by side (and also as a means to show you the effect of reflection & environment). Here’s another picture, take a moment to absorb the differences:

As you can see the cartridge on the right is all nice and shiney with very evenly spread reflections. It looks horrible ... :p

Now the cartridge on the left, that’s much better! A nice dirty surface, granular distortion in the metal
and scattered reflections.

The effect of the granularity (bump map) may seem a little overdone, but that’s just because I have carefully planned the desired effects. These cartridges were not meant to be rendered in close up (at least not this close). The effect I was looking for can be seen clearly in the very first picture in this document.

The effects (bump and dirt)

As you can see the reflections on the left cartridge are far more scattered and uneven compared to the ones on the right cartridge. This is a direct result of applying a noise map to the bump channel of the Base material. Again, take the dimensions of the object into consideration when setting the size of the noise map. In this case I set it to a very small Size of 0.05 and activated Fractal. I left everything else at their default values (including the black and white colors).

The dirt stains on the casing were created by using a standard (VRayMtI) color material Coat 1: Material #26 (VRayMtI) set to a darker shade of the base color, in combination with a smoke map Blend 1: Map #3 (Smoke) and applying a color to Color #1 in the Smoke parameters rollout, as shown below:

I have set the Blur parameter to 3 to soften the edges of the stains and have them blend in with the base material. As you can see I’ve also set a fairly small Size of 1.2 to balance out the effect.

Both materials (Coat 1 and Blend 1) are submaterials of the VRayBlendMtI, see top of document here

Conclusion

That’s basically it. No groundbreaking new technologies or super complicated shader networks. Just some
I hope this tutorial was useful and will help you in creating your own materials.

Kind regards,
JohnVK

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