



DESICCANTS & VCI

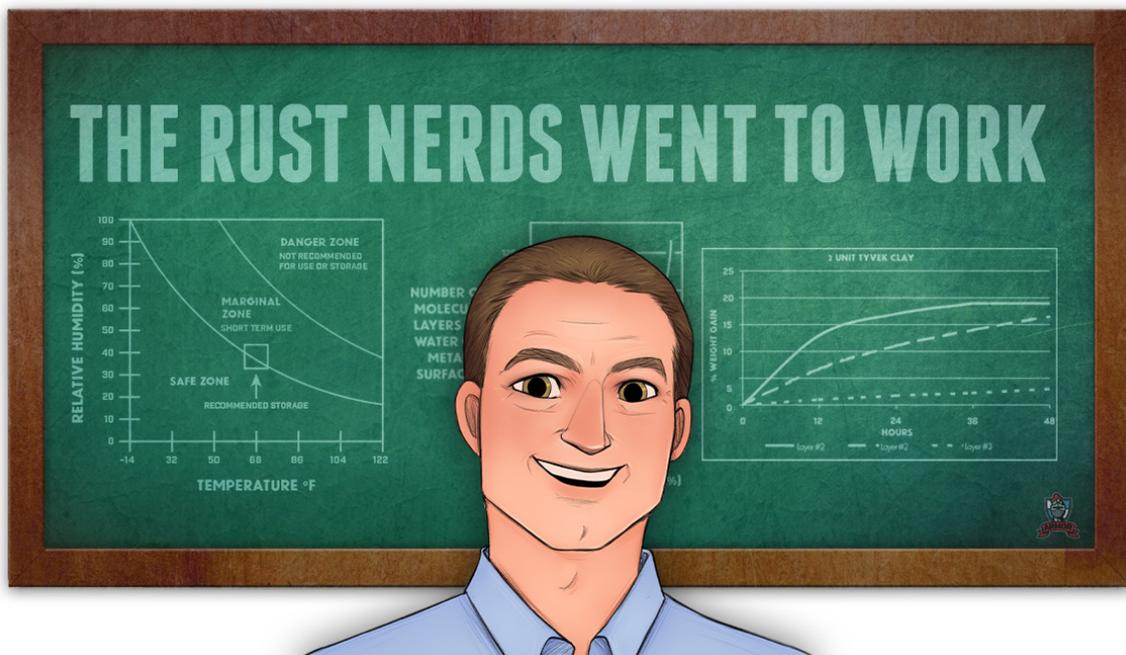
DON'T SWEAT YOUR RUST PREVENTION

DESICCANTS & VCI DON'T SWEAT YOUR RUST PREVENTION

-  **CORROSION 101**
-  **VCI VS. DESICCANT – THEIR DIFFERENCES ARE GIVE-AND-TAKE**
-  **THE DESICCANT SPECTRUM -- TYPES AND USES**
-  **SMARTY PAK – THE BEST OF BOTH WORLDS**

THE RUST NERDS

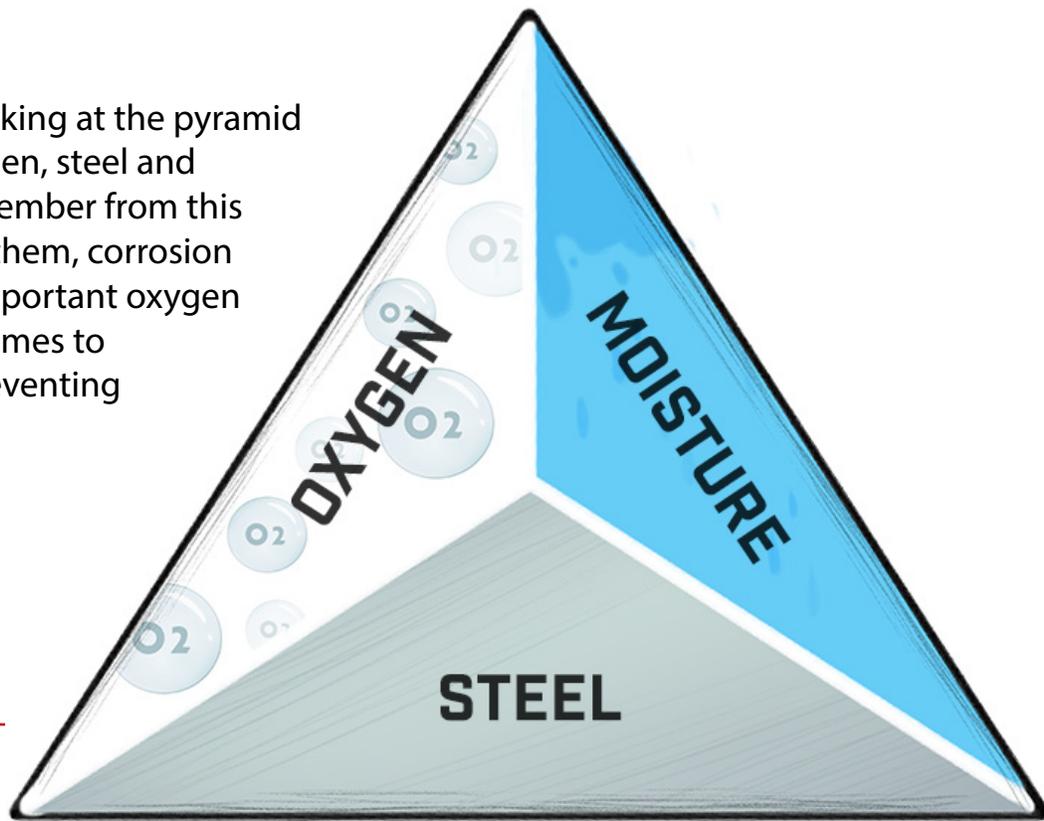
At ARMOR we are rust nerds... and we have went to work taking the arduous task of deciphering complicated graphs and slides and have made learning about corrosion and VCI, and today, desiccants – easy.



TAKING THE WORK OUT OF YOUR WORKDAY

CORROSION PYRAMID

This is the corrosion pyramid. Looking at the pyramid you can see the three sides – oxygen, steel and moisture. What I want you to remember from this pyramid is if we only have two of them, corrosion will not take place. That is how important oxygen and moisture levels are when it comes to corrosion or more importantly preventing corrosion.



CORROSION PYRAMID IN ACTION



RELATIVE HUMIDITY

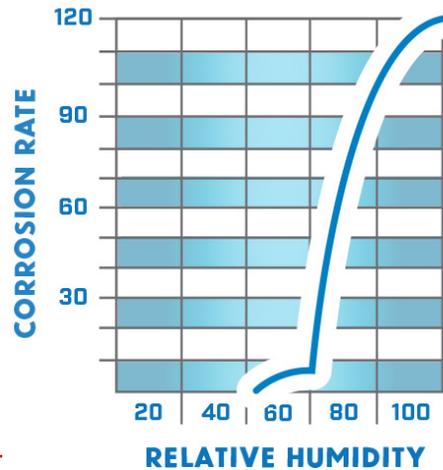
Next buzzword you will hear around corrosion is humidity or relative humidity. And we see relative humidity all the time on TV when we are looking at the weather channel. When we are watching the weather channel they will say the dew point is this temperature and the humidity is this %. Dew point is just the temperature at which water droplets begin to form or as we all call it dew and relative humidity is which is just the % of how much water vapor is in the air.



CORROSION & HUMIDITY

- THE AIR COOLS DOWN AND SHRINK DURING NIGHT HOURS
- OVER 65% RH, CORROSION RATE GOES UP 10 TIMES.

IRON CORROSION RATE AT DIFFERENT RELATIVE HUMIDITIES (%RH)



OUTDOOR STORAGE

Film doesn't "sweat" on its own... if it isn't the storage or shipping temperature causes condensation or relative humidity causes condensation, maybe it is just wood or corrugated boards adding to your moisture problem which ultimately adds to corrosion.



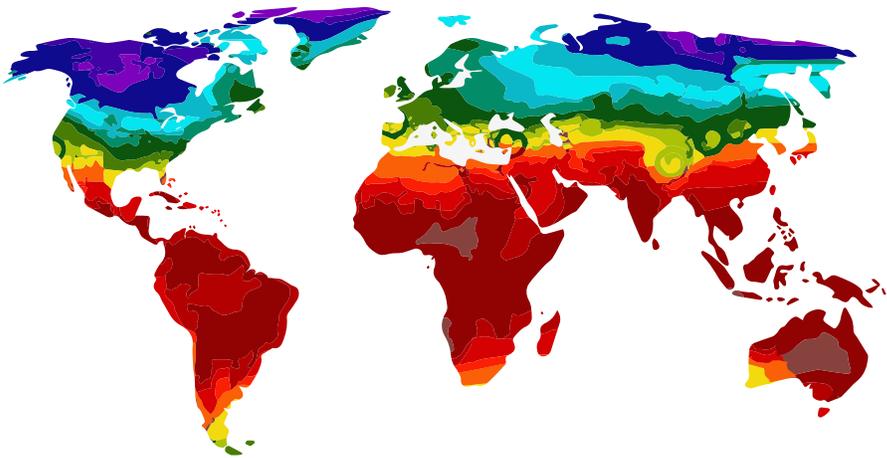
MOISTURE IN WOODEN SKIDS



21 WOODEN SKIDS IN A 40 FT CONTAINER CAN RELEASE UP TO 17.5 LBS OR 8 KGS OF WATER VAPOR.

[40 FT CONTAINER = 21 SKIDS = 21 X 19 KG = 399 KGS OF WOOD.]

HUMIDITY FLUXUATION

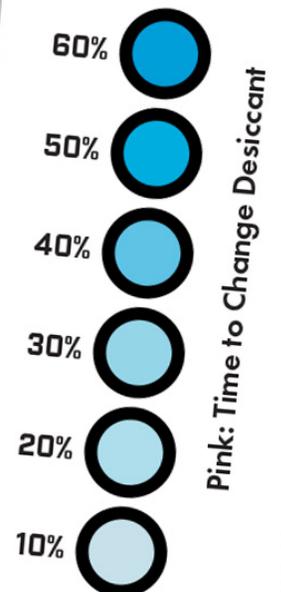


Maybe you do have a perfect manufacturing environment with a safe zone temperature and 40% relative humidity level... well all shipments and especially International shipments go through several temperature and humidity fluctuations.

HUMIDITY INDICATOR

If this starts to peak your interest about measuring humidity – we do have humidity indicator cards. If you are experience metal that leaves your plant fine and shows up rusty at its final destination and you want to measure the humidity level during the shipment; humidity indicators cards show you were the humidity maxes out during a shipment. What I mean by that is the card doesn't change back from pink to blue. So you throw this in your shipment and you see your shipment hits 60% humidity – somewhere on that trip 60% relative humidity is registered on the indicator card. If the card doesn't change or maybe just gets to 10% you know it is not humidity that is causing rust, but something else.

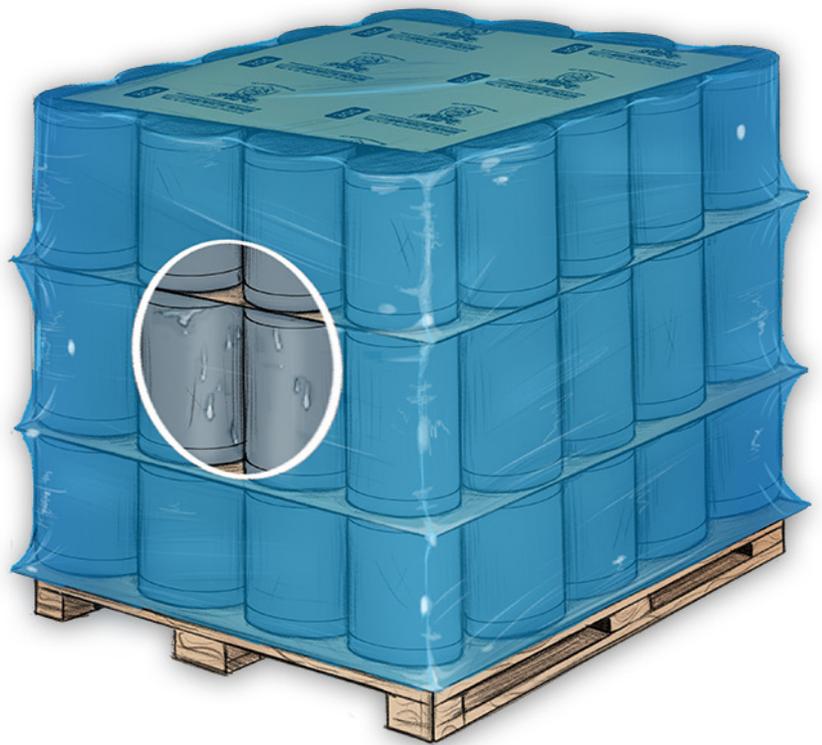
HUMIDITY INDICATOR



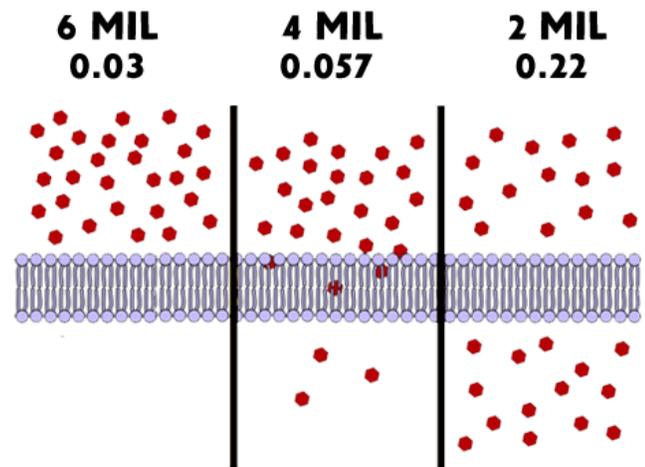
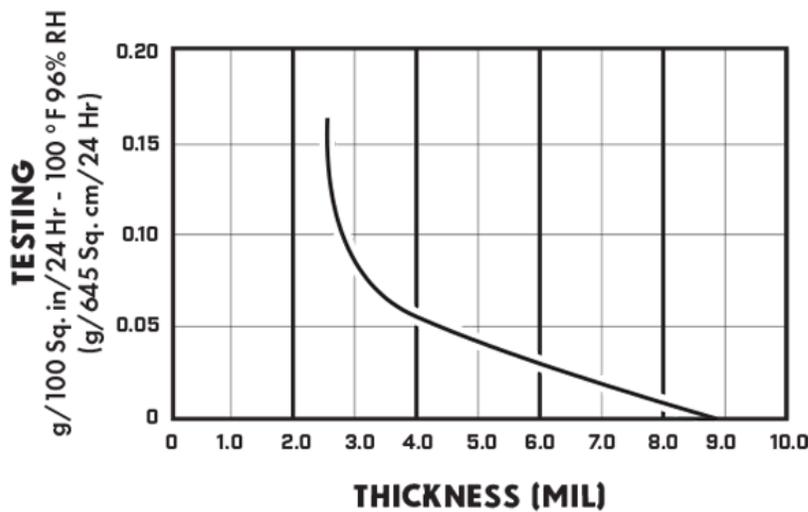
WATER SOURCES

WATER SOURCES

1. AIR INSIDE PACKAGING
2. MATERIALS INSIDE PACKAGING
3. WALLS OF PACKAGING
4. WATER PERMEATION THRU PACKAGING



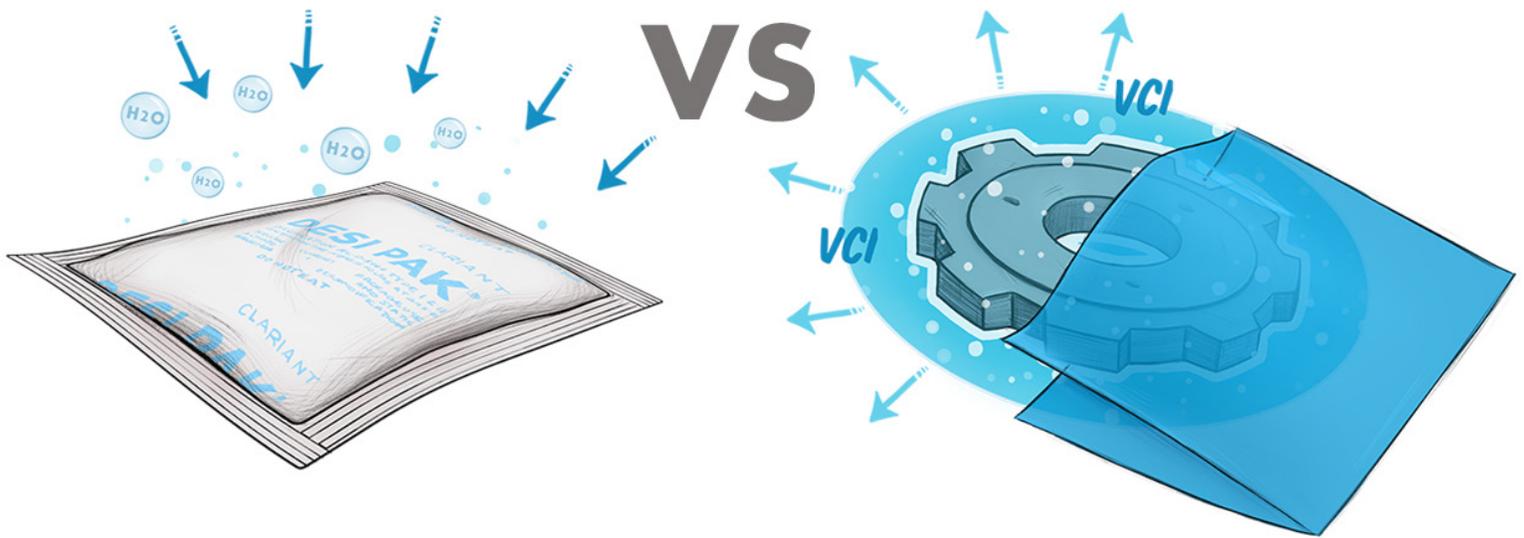
MOISTURE DIFFUSION



IN A NUT SHELL: LOW THICKNESS FILMS WILL ALLOW DESICCANTS TO PULL MOISTURE FROM OUTSIDE OF THE BAG. 2 MIL = 6 MIL X 7

DESICCANT VS VCI

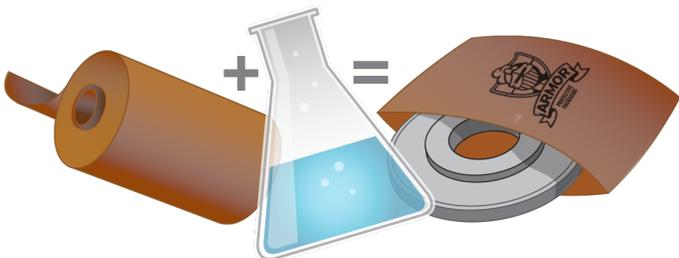
VCI and desiccants protect metal/metal parts BUT in very different ways using very different chemistry. One way to explain their differences is using a give-and-take analogy -- VCI "gives" or emits a vapor that ultimately forms a protective layer on the surface of metal while desiccant "takes" or adsorbs moisture from the packaging environment to keep metal corrosion free. Depending on the application and the particulars of the storage or shipping environment, one method may provide better results than the other or, as is the case in many give-and-take relationships, VCI and desiccants can often work together to provide premium protection of metal/metal parts.



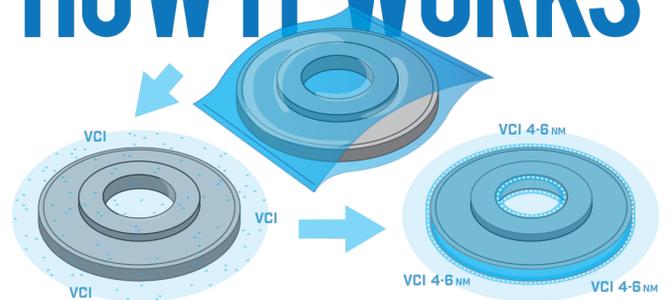
VCI, WHAT IS IT? HOW DOES IT WORK?

For VCI, you need a 'carrier' which in this picture is Kraft paper, then you coat the paper with VCI. Now carrier plus VCI equals ARMOR WRAP or ARMOR POLY, a paper or bag that can protect your clients metal parts.

VCI WHAT IS IT?



HOW IT WORKS



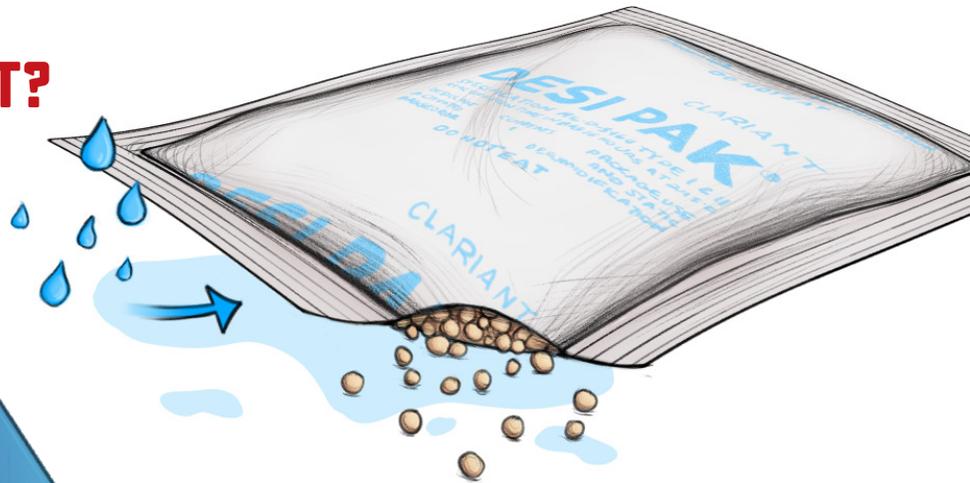
VCI THICKNESS

VCI isn't a thick or messy barrier... this is nanotechnology. The easiest way to understand nanotechnology is ARMOR VCI is 4-6 Nanometer and a single sheet of paper is 100,000 NM.

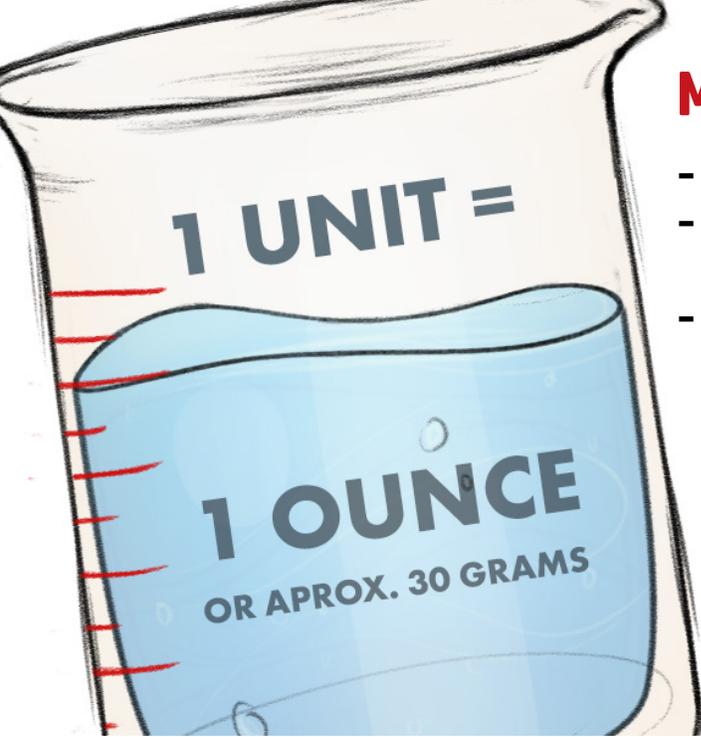


DESICCANT, WHAT IS IT?

Remember that desiccant 'takes' and how much water, how quickly and at what temperature does desiccant works depends upon the type of desiccant you use.



You are used to seeing desiccants out in the real world. Many of use see them in a new shoe box... so desiccants are out there in the world doing their job to remove moisture from packing.



MEASURING DESICCANT

- UNIT OF DESICCANT -> DRYING CAPACITY
- U.S. MILITARY'S SPECIFICATION [MIL-D-3464E]
- THE QUANTITY OF DESICCANT WHICH WILL ADSORB:
 - 3.00 GR WATER VAPOR. RH 20%. TEMP: 77°F [25°C].
 - 6.00 GR WATER VAPOR. RH 40%. TEMP: 77°F [25°C].

DESICCANT ADVANTAGES AND BENEFITS

- ✓ **SIMPLE TO USE- JUST INSERT INTO CONTAINER**
- ✓ **CLEAN- EVEN AT FULL CAPACITY DO NOT CHANGE SHAPE**
- ✓ **OPTIONS- ARMOR HAS SEVERAL OPTIONS FOR VARIOUS APPLICATIONS**
- ✓ **SOLO OR TANDEM- USE ALONE OR VCI AS A COMPLEMENT**
- ✓ **SAFE- PREVENT RUST FREE FROM OILS, HARSH CHEMICALS OR MESSY LIQUIDS**

DESICCANT DISADVANTAGES

- ✓ **NOT ALWAYS PRACTICAL TO ADD A DESICCANT TO EACH METAL PART**
- ✓ **NOT READILY RECYCLABLE**
- ✓ **ONCE SATURATED, NO LONGER CAN CONTINUE TO ADSORB**
- ✓ **ONLY ADDRESSES RUST ISSUES FROM MOISTURE-NOT OTHER CONTAMINANTS OR RUST CAUSES (VCI ADDRESS THESE BETTER)**



HUMIDITY CONTROL

- COMPLEMENTARY TO VCI
- ADSORBS EXCESS MOISTURE
- RUGGED TYVEK PACKAGE



TYPES OF DESICCANT

CLAY TYVEK DESICCANT

- ECONOMICAL DESICCANT FOR INDUSTRIAL APPLICATIONS
- HIGHLY EFFECTIVE WITHIN LESS THAN 120 DEGREES AND RELATIVE HUMIDITY

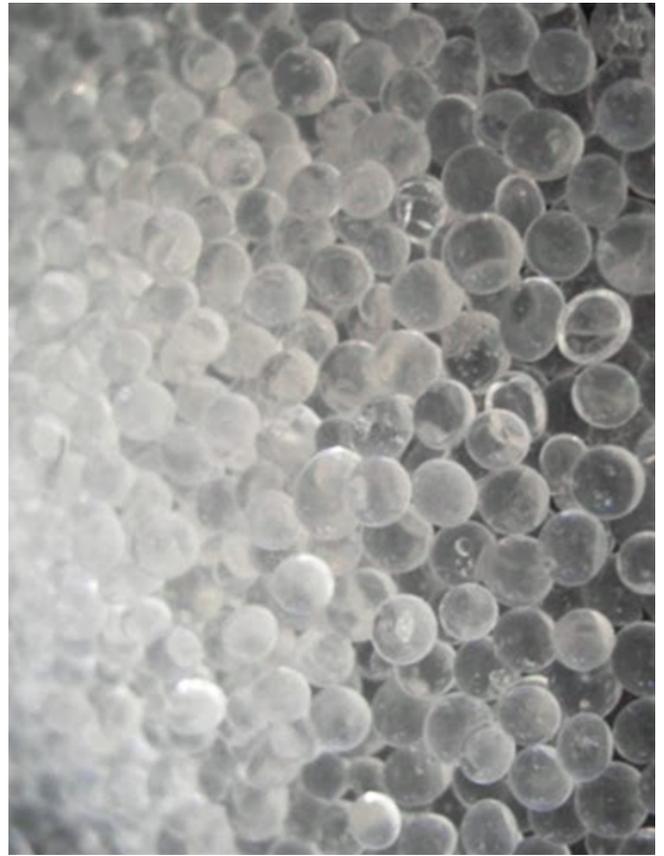


TAKING THE WORK OUT OF YOUR WORKDAY

TYPES OF DESICCANT

SILICA GEL DESICCANT

- MID-RANGE, HIGHER EFFICIENCY AND HIGHER CAPACITY DESICCANT
- BETTER SUITED THAN CLAY FOR TEMPERATURES ABOVE 120°F (49°C)
- LESS DUSTING THAN CLAY, TYPICALLY USED IN PHARMA AND FOOD APPLICATIONS



TYPES OF DESICCANT

MOLECULAR SIEVE DESICCANT

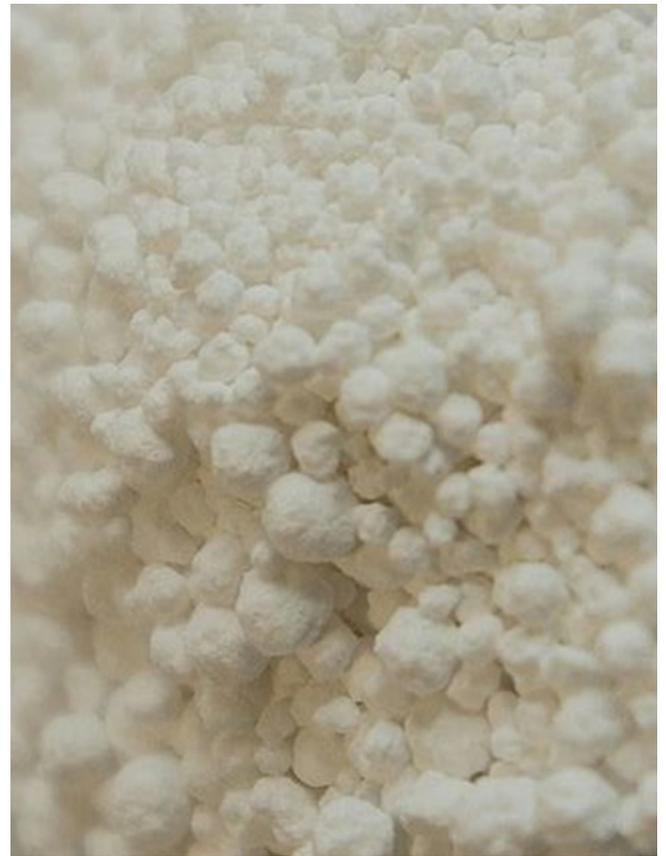
- HIGH PERFORMANCE MOISTURE/WATER REMOVAL – THEY ADSORB IT MUCH FASTER THAN OTHER DESICCANTS
- FUNCTION BETTER IN HIGH TEMPERATURES AND THEY CAN REDUCE THE HUMIDITY TO MUCH LOWER LEVELS THAN THE STANDARD SILICA GEL.



TYPES OF DESICCANT

CALCIUM CHLORIDE DESICCANT

- TYPICALLY USED IN PROTECTING CARGO
- ABSORBS UP TO 3 TIMES ITS WEIGHT IN MOISTURE
- TRAPS MOISTURE AS A THICK, NO-SPILL GEL
- PROTECTION THROUGH ALL TEMPERATURES RANGES AND RELATIVE HUMIDITY
- CONTINUES TO REDUCE THE RELATIVE HUMIDITY DOWN TO LEVELS BELOW 40% RH, WHICH DECREASES THE DEW POINT



ARMOR SHIELD VCI SKU'S

ARMOR SHIELD VCI SKU'S		
SMARTY PAK™	CLAY TYVEK	
SPVCINANO	D1/6UCT	D2UCT
SPVCIMINI	D1/3UCT	D2UCT-D
SPVCIQUAD	D1/2UCT	D4UCT-D
SILICA GEL	D1UCT	D8UCT-D
	D10GST	D16UCT-D
	D1UST	



ARMOR SMARTY PAK DOUBLE TROUBLE FOR RUST

A COMBINATION OF MOISTURE CONTROL AND VCI WORK TOGETHER TO ERADICATE RUST!



TWO-IN-ONE RUST PREVENTION

- ONE PART DESICCANT: ADSORBS MOISTURE
- ONE PART EMITTER: RELEASES ARMOR VCI NANOTECHNOLOGY™ TO PROTECT METAL



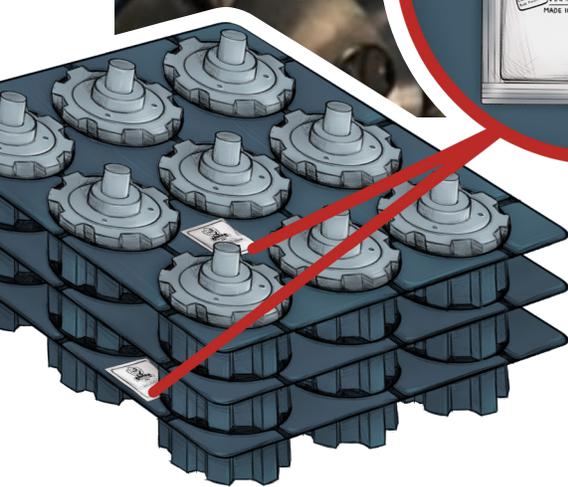
AVAILABLE IN THREE SIZES

- NANO - 1-4 CU. FT. PROTECTION
- MINI - 4-10 CU. FT. PROTECTION
- QUAD - 10-35 CU FT. PROTECTION VCI



TAKING THE WORK OUT OF YOUR WORKDAY

ARMOR SMARTY PAK



- SIMPLE TO INSTALL
- CLEAN AND DRY - NO PAPER FIBERS
- USE IN PACKAGING, STORAGE, TRANSPORT/EXPORT

TAKING THE WORK OUT OF YOUR WORKDAY

ARMOR SMARTY PAK™ VCI + DESICCANT

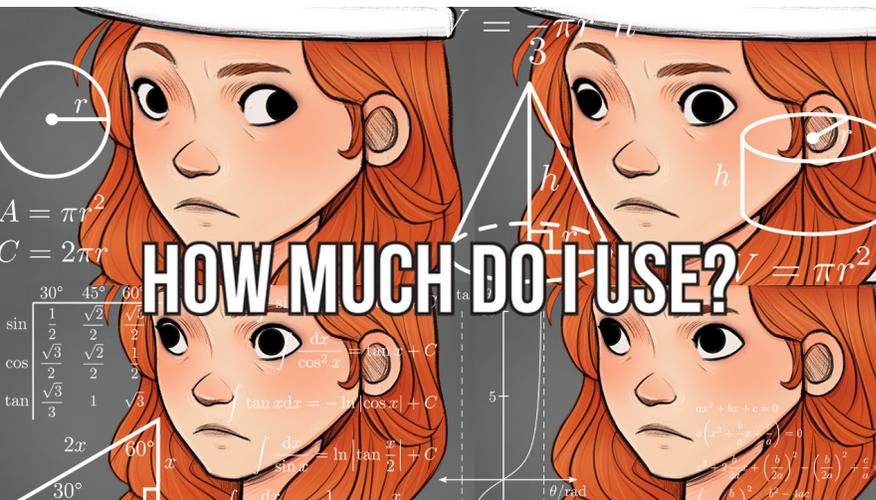
- ONE-PART ARMOR VCI NANOTECHNOLOGY™ TO PREVENT RUST, & ONE-PART SPECIALTY DESICCANT TO ADSORB MOISTURE



Depending on storage condition, adding SMARTY PAK™ VCI + DESICCANT inside the bag may be necessary.

DESICCANT

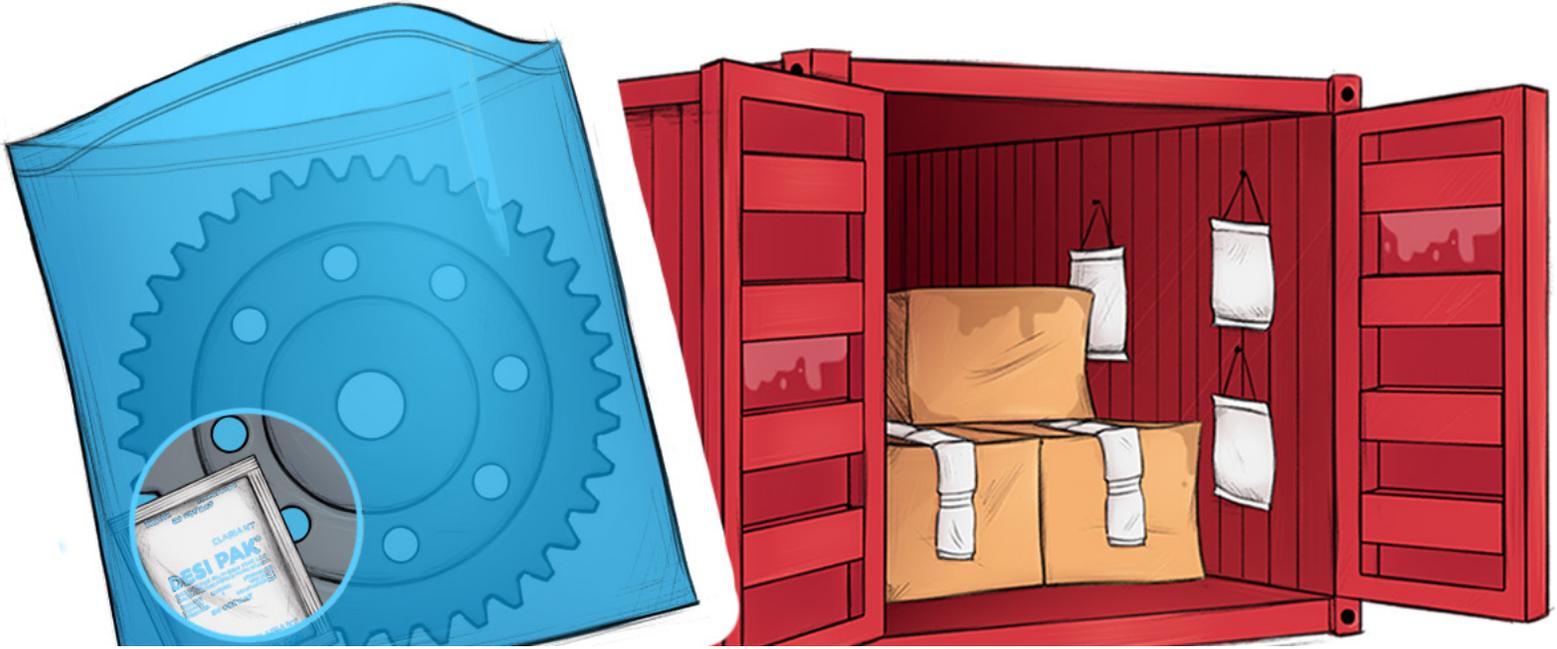
STORAGE AND HANDLING



Then the big question - how much desiccant do I use? We have also made that easy for you. Our reps use a simple desiccant calculator based off of the ideas we just talked about, we take into consideration, temperature, transportation type, void space and storage... so if you have a desiccant need and want us to work with you on how much and what type of desiccant we recommend, just give us a call!

DESICCANT

STORAGE AND HANDLING



Keep your eyes out for applications... from desiccants in individual packaging to desiccant in shipping crates and large containers, remember that corrosion pyramid – if you have moisture and metal you are going to have rust.

Armor Protective Packaging suggests that the number of removed desiccants be no more than what is needed for an eight-hour period. The desiccants **MUST** be placed within an airtight, protective container to prevent water vapor contamination during movement, temporary storage, and final use.

Desiccants begin to adsorb water vapor as soon as they are exposed to the air, so they must be protected at all times. This means desiccants removed should be used right away, and remaining desiccants should immediately be re-sealed in their container.