MechNEWS

Sept./ Oct. 2006

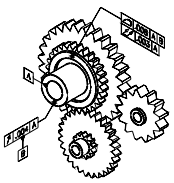
Welcome

Welcome to the September/October issue of Mech*NEWS*™, a service provided by MechSigma Consulting, Inc. In this issue, we discuss how Y14.5 and Y14.5.1 handle datums that "wobble".

We hope you enjoy this issue of Mech*NEWS*™ and continue to tell your colleagues about it.

Free Newsletter

If you are not on our emailing list and want to receive Mech*NEWS*™, contact us at: NEWS@mechsigma.com



MechSigma Consulting, Inc.
7301 Moss Ridge Rd.
Parker, TX 75002
Tel: 972.808.0153
Fax: 972.669.4028
info@mechsigma.com
www.mechsigma.com

Rocking Datums

Paragraph 4.5.1 of ASME Y14.5M-1994 states;

> "Where a nominally flat surface is specified as a datum feature, the corresponding datum is simulated by a plane contacting points of that surface."

As you know, this allows us *simulate* datums by contacting "imperfect" datum features (the features on the part) with inspection tools. These tools, called *datum feature simulators*, are not perfect, but are assumed good enough to simulate the true geometric counterparts (TGCs) of the datum features. (Refer to the Jan/Feb 2004 newsletter article, *Datum Application in Theory and Practice.*)

Unfortunately, sometimes the datum features *wobble* when they contact the simulators. We call these *rocking* datums because there is more than one contact configuration between the datum feature and the simulator. Paragraph 4.5.1 of Y14.5 goes on to state:

> "If irregularities on the surface of a primary or secondary datum feature are such that the part is unstable (that is, it wobbles) when brought into contact with the corresponding surface of a fixture, the part may be adjusted to an optimum position, if necessary, to simulate the datum."

Figure 1 shows a convex datum feature surface. Notice the two possible configurations where the feature contacts the TGC. Each of these tangent contact configurations yields a different *candidate datum*. Which candidate datum should we use? According to paragraph 4.5.1, we should use the *optimum position*. Logically, the optimum position should be the one that allows all the features that reference the datum reference frame to conform to their tolerances. If this were a part that bolts to a mating part, this is analogous to *rocking* the part to an optimum position until all the bolts fit.

(Continued)

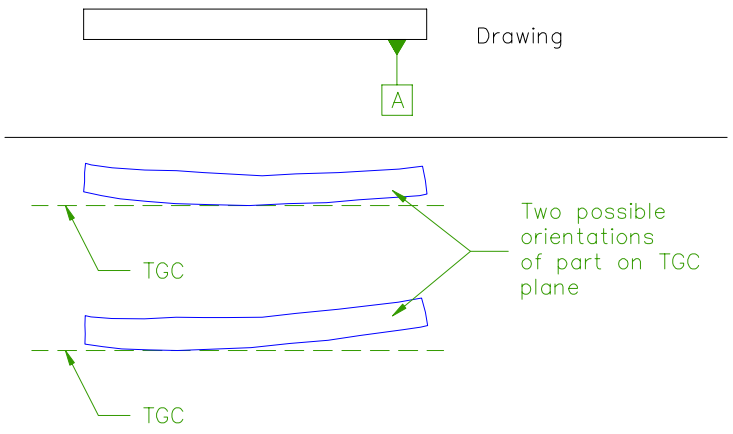


Figure 1

Need Help?

MechSigma offers on-site training in mechanical tolerancing and GD&T.

Contact us at: info@mechsigma.com

Notice in Figure 1 that the part is stable under its own weight in both *candidate* positions. Suppose we had a part that was stable under its own weight in one candidate position but required a force to achieve the second candidate position. According to Y14.5.1 (the math standard), the forced configuration in Figure 2 is unacceptable. Paragraph 4.3.2 of the math standard "limits the amount that the datum feature can rock in a manner that is roughly proportional to the form variation of the datum feature." The paragraph then details mathematically how this is done. Simply speaking, Y14.5.1 does not allow all of the contact points to be on one side of the surface. Specifically, it states that the default "cutoff" is 1/3 of the distance from the edge. Thus the lower candidate datum in Figure 2 is not allowed.

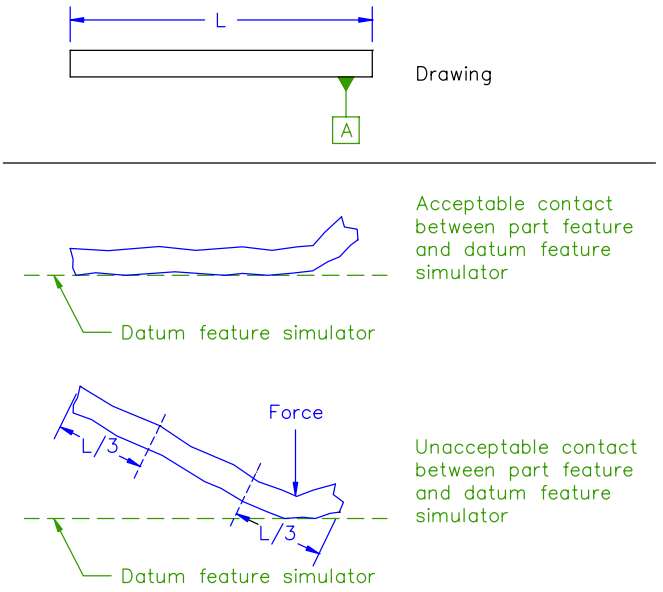


Figure 2

Summary

Oftentimes we *argue* over the best ways to optimize rocking datums. Rather than argue over how to deal with rocking datums, we focus on trying to prevent them. Paragraph 4.3.3 of Y14.5 gives guidelines to help with these instances.

> "Measurements made from a datum reference frame do not take into account any variations of the datum features. Consideration shall be given to controlling the desired accuracy of the datum features by applying appropriate geometric tolerances. Where a control of an entire feature becomes impracticable, use of datum targets may be considered or a partial surface may be designated as the datum feature."

In summary, form controls (such as a flatness control in our example) would have prevented the extreme variations shown in Figures 1 and 2. If such a control is not easily manufactured, targets should be considered to establish the datum. A

Joke of the Bi-Month

Kids on Marriage

HOW DO YOU DECIDE WHOM TO MARRY?

You got to find somebody who likes the same stuff. Like, if you like sports, she should like it that you like sports, and she should keep the chips and dip coming. - Alan, age 10

WHAT IS THE RIGHT AGE TO GET MARRIED?

Twenty-three is the best age because you know the person FOREVER by then. - Camille, age 10

HOW CAN A STRANGER TELL IF TWO PEOPLE ARE MARRIED?

You might have to guess, based on whether they seem to be yelling at the same kids. - Derrick, age 8

WHAT DO YOU THINK YOUR MOM AND DAD HAVE IN COMMON?

Both don't want any more kids. - Lori, age 8

WHAT DO MOST PEOPLE DO ON A DATE?

On the first date, they just tell each other lies and that usually gets them interested enough to go for a second date. - Martin, age 10

WHAT WOULD YOU DO ON A FIRST DATE THAT WAS TURNING SOUR?

I'd run home and play dead. The next day I would call all the newspapers and make sure they wrote about me in all the dead columns. -Craig, age 9

WHEN IS IT OKAY TO KISS SOMEONE?

When they're rich. - Pam, age 7

IS IT BETTER TO BE SINGLE OR MARRIED?

It's better for girls to be single but not for boys. Boys need someone to clean up after them. - Anita, age 9

HOW WOULD YOU MAKE A MARRIAGE WORK?

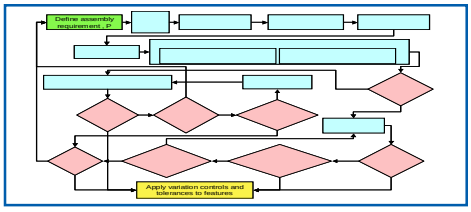
Tell your wife that she looks pretty, even if she looks like a truck. - Ricky, age 10

Events:

The next meeting of the Y14 Committee is scheduled for the week of February 5, 2007, at the Helmsley Sandcastle Hotel in Sarasota, Florida. These meetings are open to the public.

Mechanical Tolerancing Methodology

We offer a comprehensive methodology, *MechPRO*™, that takes your assembly tolerance requirements and automatically defines the (GD&T) controls and allowable tolerances to control part variation to Six Sigma quality. We offer: an analysis software tool, *MechTOL*™; a database software tool, *MechDATA*™, and a three-day workshop to support this methodology.



*MechSigma Consulting, Inc. * 7301 Moss Ridge Rd. * Parker, TX 75002 * Tel: 972.808.0153 * Fax: 972.669.4028 * info@mechsigma.com * www.mechsigma.com*