

## Interpretations of AGMA Standards

**W**hen AGMA receives questions about its standards, they are submitted to the appropriate Technical Committee for a response. The questions and AGMA's response are published in the *Gear Industry Journal* to ensure wide distribution of the information. Send your questions to [tech@agma.org](mailto:tech@agma.org).

### Comment Restated

I have recently discovered what I believe to be an error in ANSI/AGMA 6123-A88, Design Manual for Enclosed Epicyclic Metric Module Gear Drives. In the example in section 7, Circulating power, beginning on page 23, the third paragraph on page 24 states:

"If we assume an overall efficiency of 100 percent, the remaining required torque of the primary planets is provided by the mesh between the planets and the primary ring gear. The magnitude of this torque is:  
 $435.8 - 42.85 = 393.0 \text{ N-m}$ " (A)

However, from the free body diagram of the compound planets:

$$\Sigma \text{Torques} = T_{sp1} + T_{p1r1} + T_{p2r2} = 0$$

Where

$T_{sp1}$  is sun - planet1 mesh torque;

$T_{p1r1}$  is planet1 - ring1 mesh torque;

$T_{p2r2}$  is planet2 - ring2 mesh torque.

Therefore,

$$T_{sp1} + T_{p2r2} = -T_{p1r1}$$

Thus, the paragraph should read something like, "If we assume an overall efficiency of 100 percent,

the required reaction torque on the compound planets is provided by the mesh between the primary planets and the primary ring gear. The magnitude of this torque is:  
 $42.85 \text{ M-m} + 435.8 \text{ N-m} = -478.7 \text{ N-m}$ "

The fifth paragraph on page 24 should then read: "Additional power transfer at the wprimary planet-primary gear mesh is:  
 $(-478.7 \text{ N-m} \times -268.2 \text{ rpm})/9549 = 13.45 \text{ kW}$ " (B)

And the sixth paragraph:  
"The sum of power transfer between the two primary meshes is  $-1.204 + 13.45 = 12.24 \text{ kW}$ , which is equal to the power transfer in the secondary gear mesh."

### AGMA's Response

Clause 7 of ANSI/AGMA 6123-A88 discusses the fact that certain types of planetary configurations have internal power circulation that is greater than the input power. To illustrate the concept an example with appropriate calculations is provided.

The committee agrees with the fundamental observations provided by the requestor. Based on their review, equation (A) noted above for the total torque at the planets and primary planet to ring gear mesh should read:

$$435.850 + 42.859 = 478.709 \text{ Nm}$$

Then, equation (B) for the power transfer at the planet to ring gear mesh is:  
 $(478.709 \times 268.200) / 9549 = 13.445 \text{ kW}$

And the sixth paragraph should read: "The sum of power transfer between the two primary meshed is  $13.445 - 1.204 = 12.241 \text{ kW}$ , which is equal to the power transfer in the secondary gear mesh."

The end result for this power is thus correct, and the total power transfer as given in paragraph 7 is still 24.482 kW.

For your information, the Epicyclic Enclosed Drive Committee has recently completed its development of the next version of this design manual, and we anticipate its release over the next few months. The group has introduced much of its experience gathered since the original release to produce an extremely comprehensive resource. It is the committee's intent to incorporate the results of this request for interpretation into the new document.

### Free Body Diagram of System

