

Program_A.II.1

```

c This program find the saturated water and saturated steam properties
c as functions of temperature.
c UNITS:
c T: F
c v: lbm/ft3
c u: Btu/lbm
c h: Btu/lbm
c P: Psia
c:
    print *, 'Enter > Temperature (F)'
    read(*,*) T
    call
1 wasapr(T,P,vf,vfg,vg,hf,hfg,hg,uf,ufg,ug,dpdt,
1          dvfdt,dvfgdt,dvgdt,dhfdt,dhfgdt,dhgdtdt,
2          dufdt,dufgdt,dugdt)
    dtdp=1./dpdt
    write(*,*) t,p,hf,hg,dpdt,dtdp
    stop
    end

c
    subroutine wasapr(t,p,vf,vfg,vg,hf,hfg,hg,uf,ufg,ug,dpdt,
1          dvfdt,dvfgdt,dvgdt,dhfdt,dhfgdt,dhgdtdt,
2          dufdt,dufgdt,dugdt)

c
c
c          NEWSAT.FOR
c
c
c Water properties p, vf, vfg, uf, and ufg are correlated to saturated
c tempearture between 32 and 656 Deg F. All English units.
c
c
    data c/.1850899/
    if(t.lt.32.0.or.t.gt.656.0) go to 1
    call psatot(t,p,dpdt)
    call vfsatt(t,vf,dvfdt)
    call vfgsat(t,vfg,dvfgdt)
    call ufsatt(t,uf,dufdt)
    call ugsatt(t,ug,dugdt)
    vg=vf+vfg
    dvgdt=dvfdt+dvfgdt
    ufg=ug-uf
    dufgdt=dugdt-dufdt
    hf=uf+c*p*vf
    hg=ug+c*p*vg
    hfg=hg-hf
    dhfdt=dufdt+c*(dpdt*vf+p*dvfdt)
    dhgdt=dugdt+c*(dpdt*vg+p*dvgdt)
    dhfgdt=dhfdt+dhgdt
    return
1 continue
    write(*,2)

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2   format(' Sat. Temp. Outside of the Range of Properties.')
   end
c
   subroutine psatot(tsat,psat,dpdt)
   dimension b(8)
   data a,b(1),b(2),b(3),b(4),b(5),b(6),b(7),b(8)/.6962719,
1      -.3579628e-1,.7568188e-3,-.6924369e-5,.4086826e-7,
2      -.1124099e-9,.2708745e-12,-.3145232e-15,.1427914e-18/
c
   arg=0.0
   argp=0.0
   do 1 i=1,8
       arg=arg+b(i)*(tsat**i)
       argp=argp+i*b(i)*(tsat**(i-1))
1   continue
   psat=a+arg
   dpdt=argp
   return
   end
c
c
   subroutine vfsatt(tsat,vf,dvfdt)
   dimension b(8)
   data a,b(1),b(2),b(3),b(4),b(5),b(6),b(7),b(8)/62.11036,
1      .1722592e-1,-.2852652e-3,.1485193e-5,-.6087479e-8,
2      .1660097e-10,-.2821841e-13,.2669788e-16,-.1077666e-19/
c
   arg=0.0
   argp=0.0
   do 1 i=1,8
       arg=arg+b(i)*(tsat**i)
       argp=argp+b(i)*(tsat**(i-1))
1   continue
   vf=1./(a+arg)
   dvfdt=-vf*vf*argp
   return
   end
c
c
   subroutine vfgsat(tsat,vfg,dvfgdt)
   dimension b(10)
   data a,b(1),b(2),b(3),b(4),b(5),b(6),b(7),b(8),b(9),b(10)/
1      9.429309,-.4471527e-1,.1089104e-3,-.1994522e-6,
2      -.4738610e-10,.2567196e-11,-.1197328e-13,.3006035e-16,
3      -.4408149e-19,.3543467e-22,-.1208486e-25/
c
   arg=0.0
   argp=0.0
   do 1 i=1,10
       arg=arg+b(i)*(tsat**i)
       argp=argp+i*b(i)*(tsat**(i-1))
1   continue

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```
vfg=exp(a+arg)
dvfgdt=vfg*argp
return
end
```

c

c

```
subroutine ufsatt(tsat,uf,dufdt)
dimension b(8)
data a,b(1),b(2),b(3),b(4),b(5),b(6),b(7),b(8)/-31.33822,
1 .9664909,.6886926e-3,-.7099748e-5,.3951334e-7,-.1246218e-9,
2 .2283063e-12,-.2246668e-15,.9254311e-19/
```

c

```
arg=0.0
argp=0.0
do 1 i=1,8
    arg=arg+b(i)*(tsat**i)
    argp=argp+i*b(i)*(tsat**(i-1))
1 continue
uf=a+arg
dufdt=argp
return
end
```

c

c

```
subroutine ugsatt(tsat,ug,dugdt)
dimension b(8)
data a,b(1),b(2),b(3),b(4),b(5),b(6),b(7),b(8)/1016841.,
1 920.3534,-4.762259,.4607905e-1,-.2479441e-3,.7584943e-6,
2 -.1346369e-8,.1283154e-11,-.5100722e-15/
```

c

```
arg=0.0
argp=0.0
do 1 i=1,8
    arg=arg+b(i)*(tsat**i)
    argp=argp+i*b(i)*(tsat**(i-1))
1 continue
ug=sqrt(arg+a)
dugdt=0.5*argp/ug
return
end
```